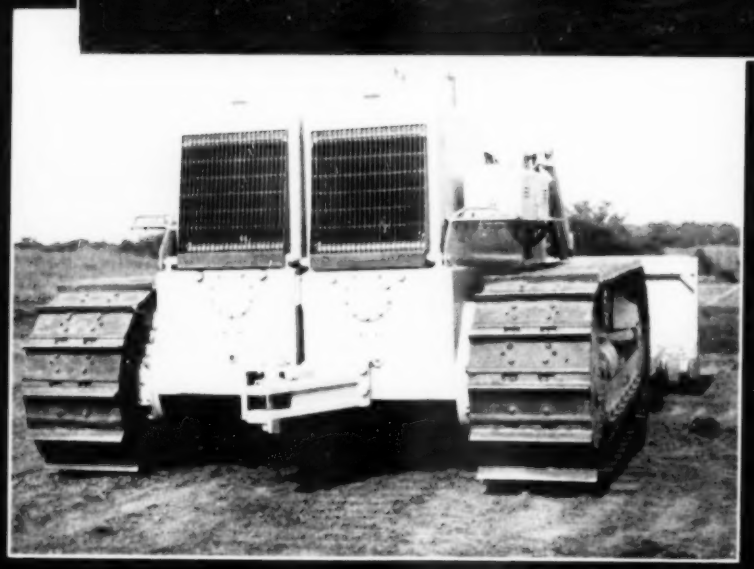
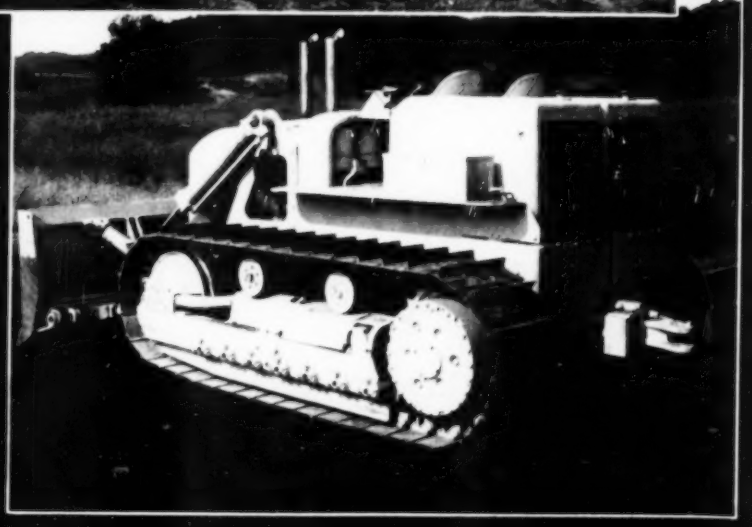
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

DIESEL PROGRESS





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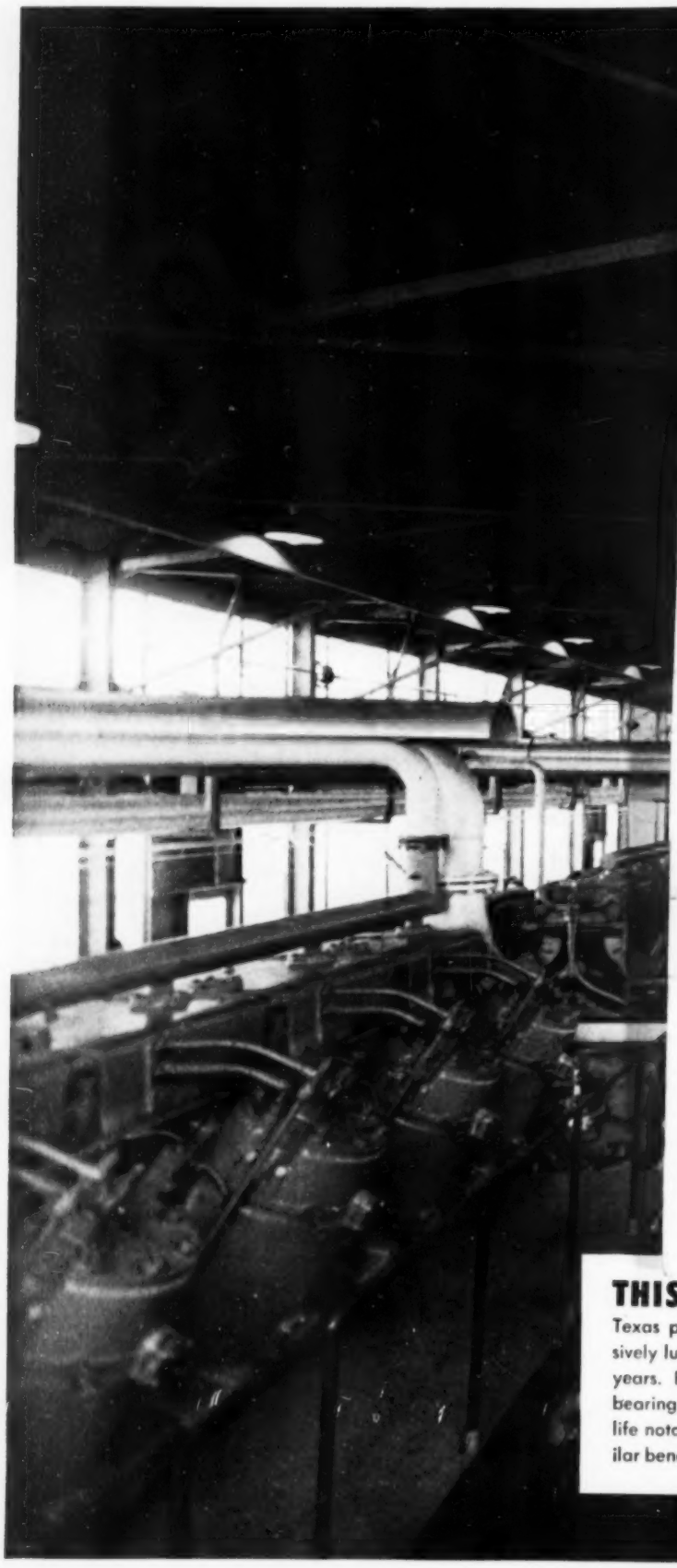

WA

PAG

THIS BATTERY of gas engines in a Texas plant (name on request) has been exclusively lubricated with *Texaco Ursa Oil P* for many years. Efficiency has been outstanding — rings, bearings and cylinder liners in A-1 condition, parts life notably long, maintenance costs low. For similar benefits, use one of the *Texaco Ursa Oil* series.

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STAR THEATER
starring DONALD O'CONNOR
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Saturday nights,
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TEXACO

U

GET MORE POWER
H LESS
• • •

AVY
GES

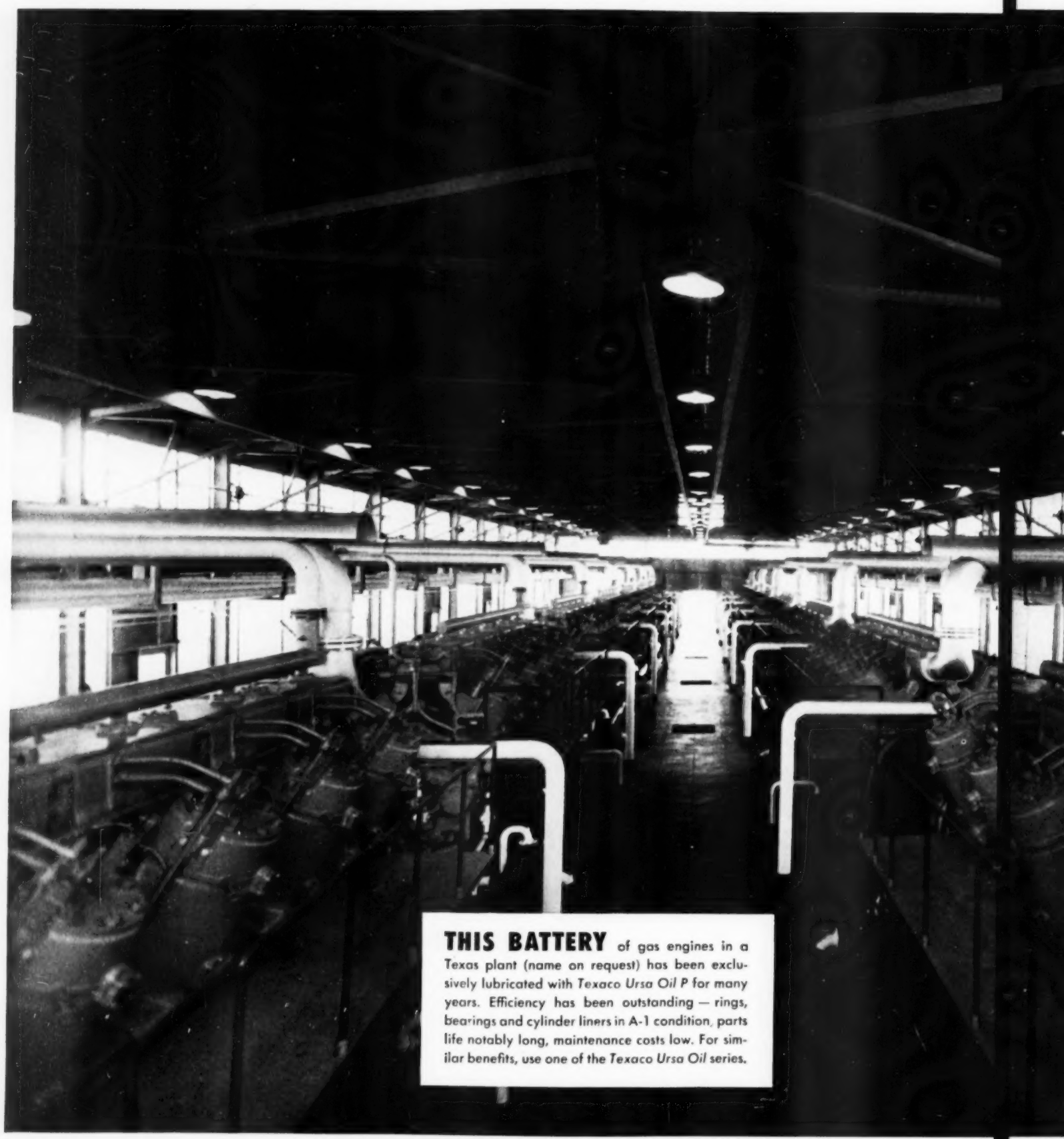
WHETHER you're running
engines, the right lubricating oil is the
d to the type of engine, the fuel used and
s. To be sure of the right oil, use one of
a Oil series.
series is a complete line of lubricating oils
ake diesel, gas and dual-fuel engines give
uel over *longer periods* between overhauls.
why —

venty years, more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

Whatever the engine — its size, type, speed or fuel used — the right lubricant for it is in the *Texaco Ursa Oil* series. Your Texaco Lubrication Engineer will gladly help you select it.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



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TUNE IN . . . TEXACO
STAR THEATER
starring DONALD O'CONNOR
or JIMMY DURANTE
on television . . .
Saturday nights,
NBC.

TEXACO

U

GET MORE POWER WITH LESS FUEL...

WHETHER you're running diesel, gas or dual-fuel engines, the right lubricating oil is the one that is exactly suited to the type of engine, the fuel used and the operating conditions. To be sure of the right oil, use one of the famous *Texaco Ursa Oil* series.

The *Texaco Ursa Oil* series is a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines give *more power* with *less fuel* over *longer periods* between overhauls. These benefits explain why —

For more than twenty years, more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

Whatever the engine — its size, type, speed or fuel used — the right lubricant for it is in the *Texaco Ursa Oil* series. Your Texaco Lubrication Engineer will gladly help you select it.

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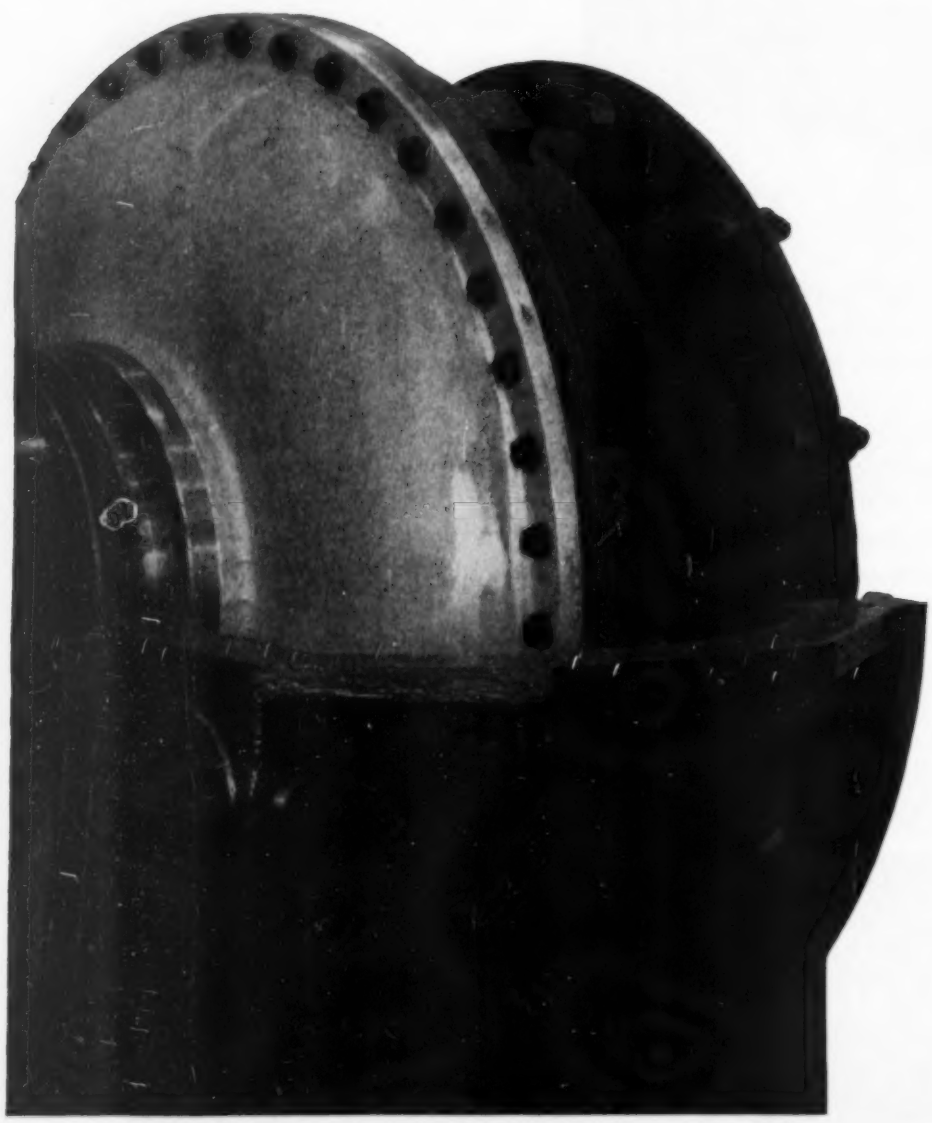
URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

APPLICATIONS UNLIMITED

New Alcoa Casting Technique Makes 34" Torque Converter Available



Until recently, a 26" torque converter was just about as large as any on the market. Larger ones were desired but normal fabrication methods required considerable financial outlay. That's why National Supply engineers, with Alcoa development engineers, looked for other practical production methods. Alcoa's newly developed plaster casting technique seemed the most likely method and with close co-operation the large pumps, turbine, stators and driving bells were designed in aluminum.

Alcoa's skilled patternmakers, working from National's engineering calculation sheets produced the various blade shapes. Our research division developed the technique of casting these complicated blade shapes and obtaining an exceptionally smooth finish in the blade area. Our foundry improved the methods of making plaster cores and sound castings. Our development engineers stress analyzed and spin tested the machined castings and contributed to the redesign until objective was reached. *The result was a torque converter so efficient, so powerful, that National is not prepared to set ANY limits to its applications!*

The same men, the same materials and machines, which produced such outstanding castings for The National Supply Company, are ready to help solve your own problems. Just contact your nearby Alcoa sales engineer and set up a meeting —no obligation, of course. The Alcoa sales office is listed under "Aluminum" in the classified section of your telephone directory. Or write: ALUMINUM COMPANY OF AMERICA, 1987-L Alcoa Building, Pittsburgh 19, Pa.

A NOTE OF INTEREST TO MACHINE DESIGNERS

Since, once the pieces are cast, there is no way to machine inner parts, it was Alcoa's job to produce such a fine blade finish that no such work would be required.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

DIESEL and GAS ENGINE PROGRESS

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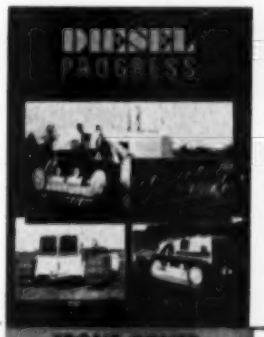
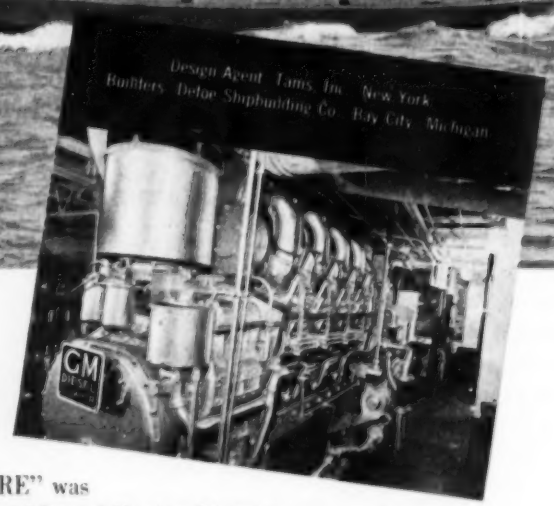


FRONT COVER ILLUSTRATION

Three views of the New Euclid 380 hp., 55,000-pound, twin engine diesel crawler tractor designated the TC-12. Two GM 6-71 engines give the tractor its power. They drive through Allison torque converters and Torqmatic transmissions.

7th worker for Great Lakes Dredge and Dock Co.



The "JOHN A. McGUIRE," newest GM Diesel-powered tug in the Great Lakes Dredge and Dock fleet, was designed for use in Great Lakes harbors and for river towing of dredges and dredge scows. "JOHN A. McGUIRE" was designed and built to the specifications of the Cleveland Diesel Engine Division of General Motors and is powered by the 8-cylinder GM Model 278A Diesel shown above.

Great Lakes Dredge and Dock Company now has 7 General Motors Diesel-powered tugs in its fleet—four operating on the Great Lakes and three working out of New York.

Your Cleveland Diesel Engine Division Representative will show you how efficient, modern General Motors Diesel-powered tugs can cut your costs. Call or write today for complete information.

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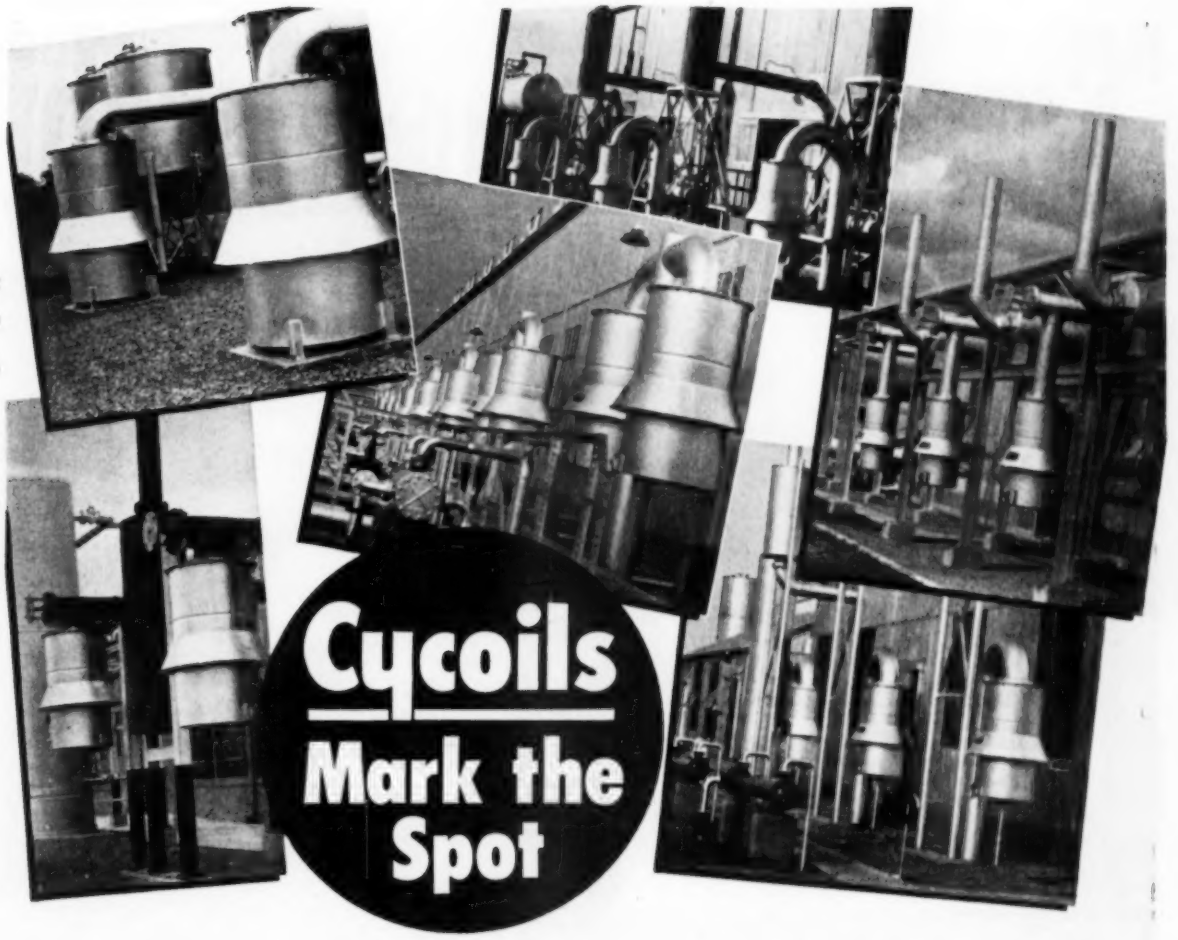


Where Engines and Compressors Enjoy Complete Dust Protection

Such spots are numbered by the hundreds. Nor are all of them confined to the "dust bowl" areas of the nation. Find a cost-minded management that recognizes how dust damage contributes to engine down-time and repairs and you'll find dependable Cycoil Oil Bath Air Cleaners on the job.

What's the secret of Cycoil's industry-wide acceptance? They're designed to fight for every particle of dust. Thorough mixing of oil with the intake air at the start results in over 90% of the dust content being trapped before it even reaches the Cycoil's filter pads. Then comes the final cleaning action of the filter pads for removal of the remaining 10%. Net result—approximately 100% clean air.

Why not get a firsthand report from the folks who really keep a running score on Cycoil performance? Write us today for list of representative users and complete Cycoil data.

AAF **American Air Filter**
COMPANY, INC.

408 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

"Scramming" on the Mesabi

INTERNATIONAL TD-14A puts speed and power into one of the first operations of its kind in the east end of Mesabi Range. Lenci & Politano took the "scramming" contract for the removal of small pockets and deposits of ore remaining after the big equipment had been taken away. They report the little crawler was just right for the close quarters and heavy going.

INTERNATIONAL Crawler makes a big impression on east end of the Range

What's "scramming?" It's cleaning up the small pockets and deposits of ore that remain after main ore body has been worked. It is a job that brings out the special abilities of smaller crawlers in the complete INTERNATIONAL line according to Lenci & Politano, "scramming" contractors in the east end of Mesabi Range.

An INTERNATIONAL TD-14A was used in the operation. Operator Leonard Lehman, who had always handled big crawlers before, has this to say:

"The way that tractor can get around in tight corners and the size of the load it can handle were things I had not expected. It showed me there is a place for the smaller INTERNATIONAL crawler even in such a big operation as mining the Mesabi Range!"

Do you need big power— little power—or somewhere in between? See the man who can fix you up just right, and keep it rolling for you. That's your INTERNATIONAL Industrial Distributor. Get in touch with him soon for a demonstration of "power that pays!"

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

For every move in Earthmoving

ON TRACKS ...ON RUBBER

See INTERNATIONAL'S "Job-Phased"* equipment

INTERNATIONAL HARVESTER

POWER THAT PAYS

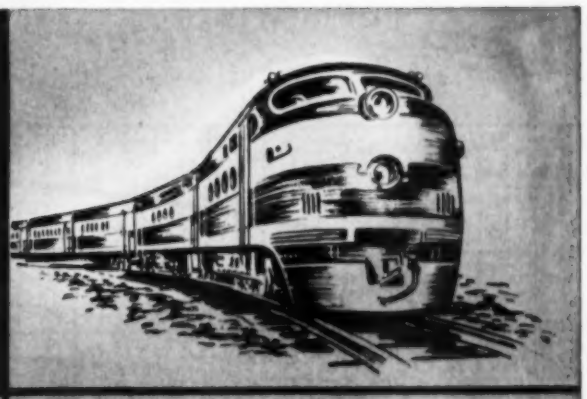
INTERNATIONAL

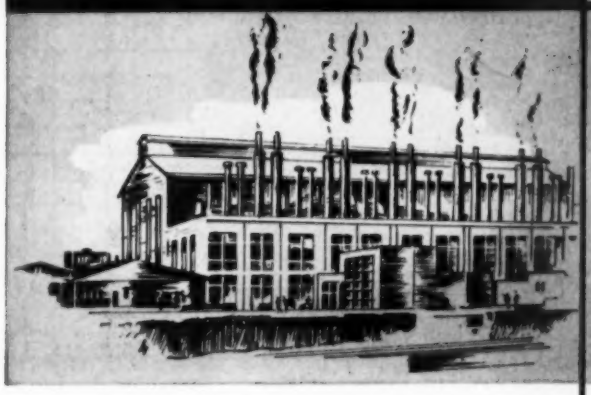
**Phased* Equipment—Machines designed and built to handle each major phase of earthmoving most efficiently and economically.

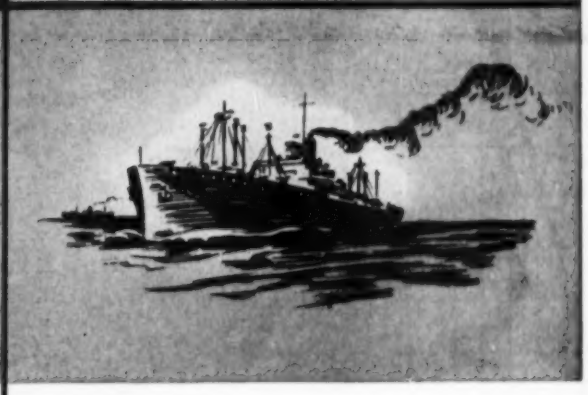
Dependable

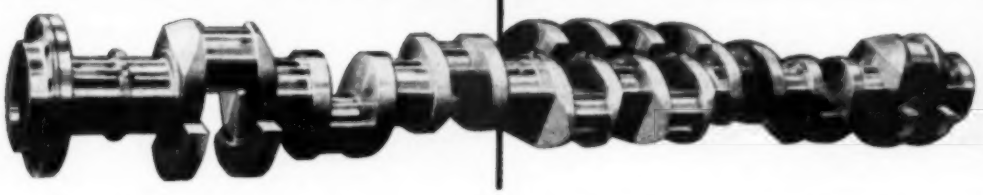
Transmission of Power . . .

ERIE FORGE Diesel Crankshafts!



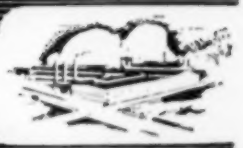






Here's the "Giant in the Diesel" . . . transmitting power that drives the modern railroad engines, pushes huge ships speedily and surely through the waves, or runs the power plants of business and industry. Erie Forge crankshafts are produced — from pouring of ingot to finished product — in our own plant. Every step is under the complete control of experienced craftsmen . . . one control, one responsibility. At Erie Forge you get the full benefit of our know-how and experience in the production of highest quality crankshafts — of exactly the right material to meet the most rigid requirements. Consult with Erie Forge on your next shafting requirements.

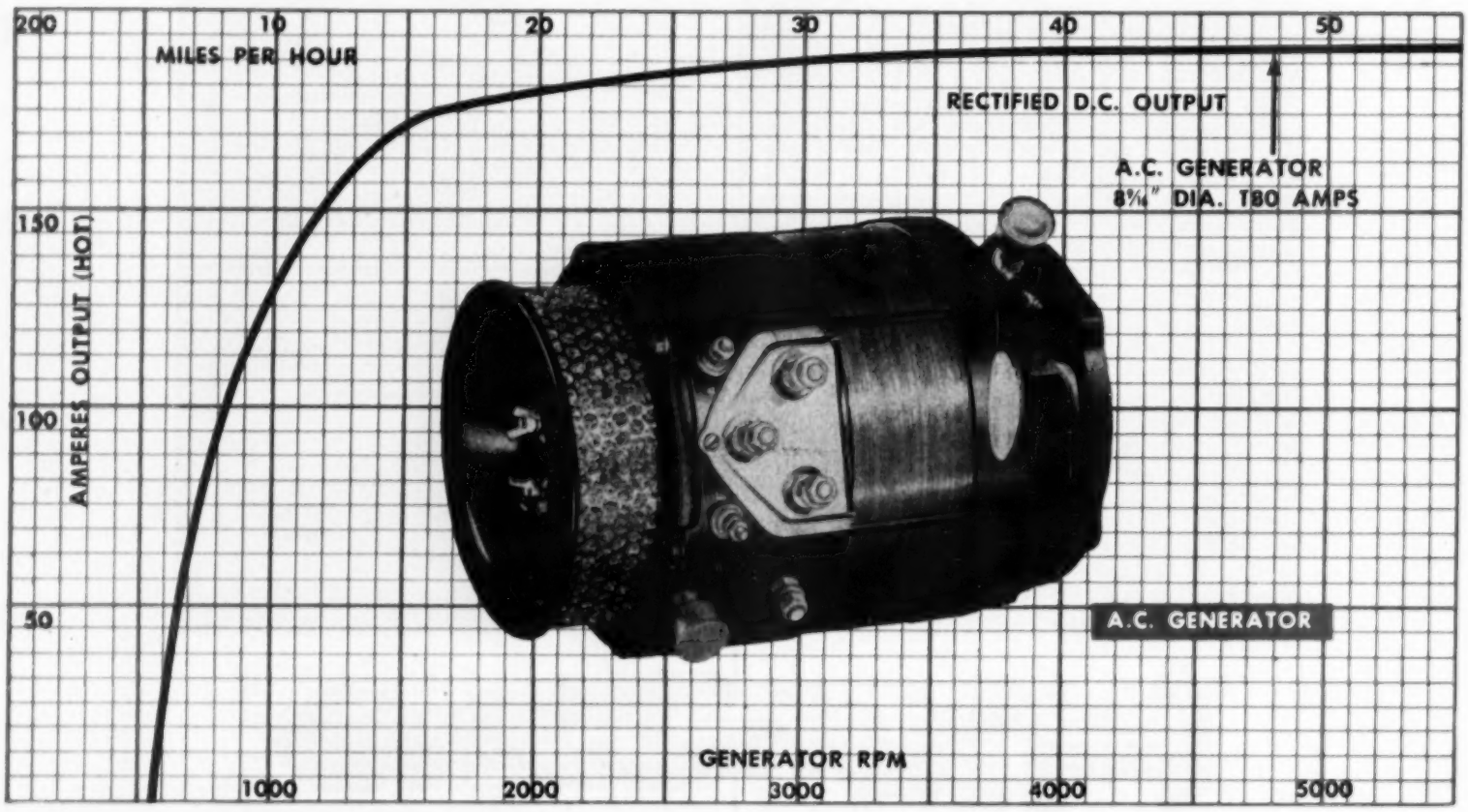
ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



Power Packed and

DELCO-REMY A. C. GENERATOR

Heavy-Duty 180-Ampere Output Capacity



Rectifier

Regulator

The Delco-Remy A.C. generator is the heart of a 12-volt A.C.-D.C. electrical system designed specifically for modern buses with fluorescent lighting and extra-heavy electrical loads.

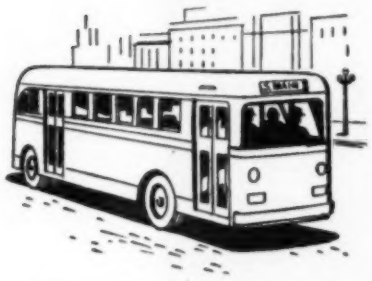
Desirable performance characteristics include cut-in at approximately 550 generator rpm . . . maximum output of 180 amperes at approximately 2000 rpm. The new generator supplies not only alternating current for fluorescent lights but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

Impressive features of the new generator are its light weight, its very high output capacity, and its ability to operate over a wide speed range with greatest efficiency. Specify Delco-Remy electrical equipment on your new buses.

AS A DIVISION OF GENERAL MOTORS, WE ARE PROUD TO JOIN IN CELEBRATING THE BUILDING OF GM'S FIRST 50 MILLION CARS.

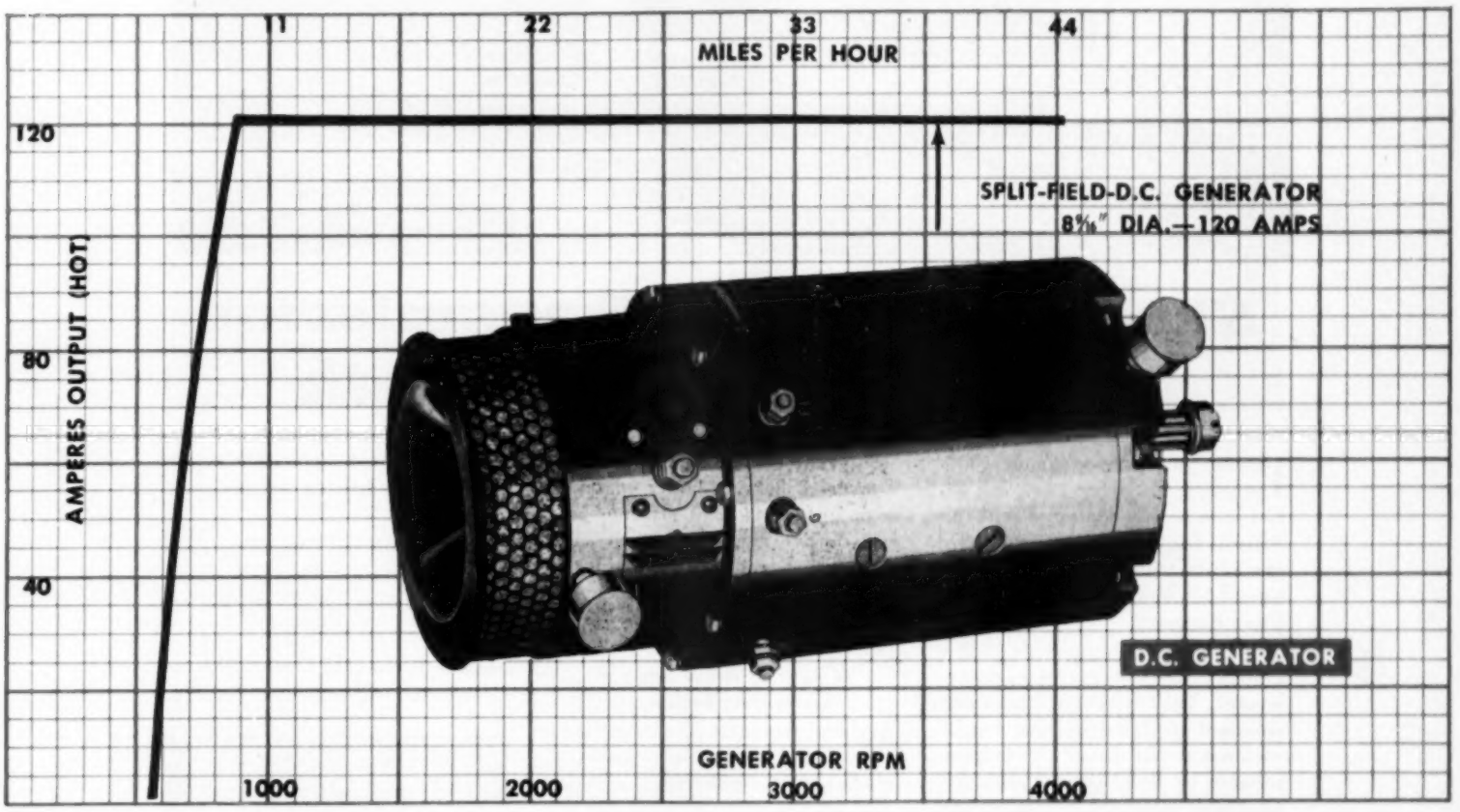
WHEREVER WHEELS TURN OR PROPELLERS SPIN

Right for the Job



DELCO-REMY D. C. SPLIT-FIELD GENERATOR

Heavy-Duty 120-Ampere Output Capacity



The Delco-Remy 12-volt split-field generator and its companion regulator are rugged and dependable—designed to meet the needs of transit buses having increased electrical loads coupled with a high percentage of engine idling time.

Desirable performance characteristics include low cut-in, high output at engine idle, and quick attainment of maximum output. Cut-in occurs at approximately 550 generator rpm; output reaches 70 amperes at approximately 700 rpm, maximum controlled output of 120 amperes above 850 rpm.

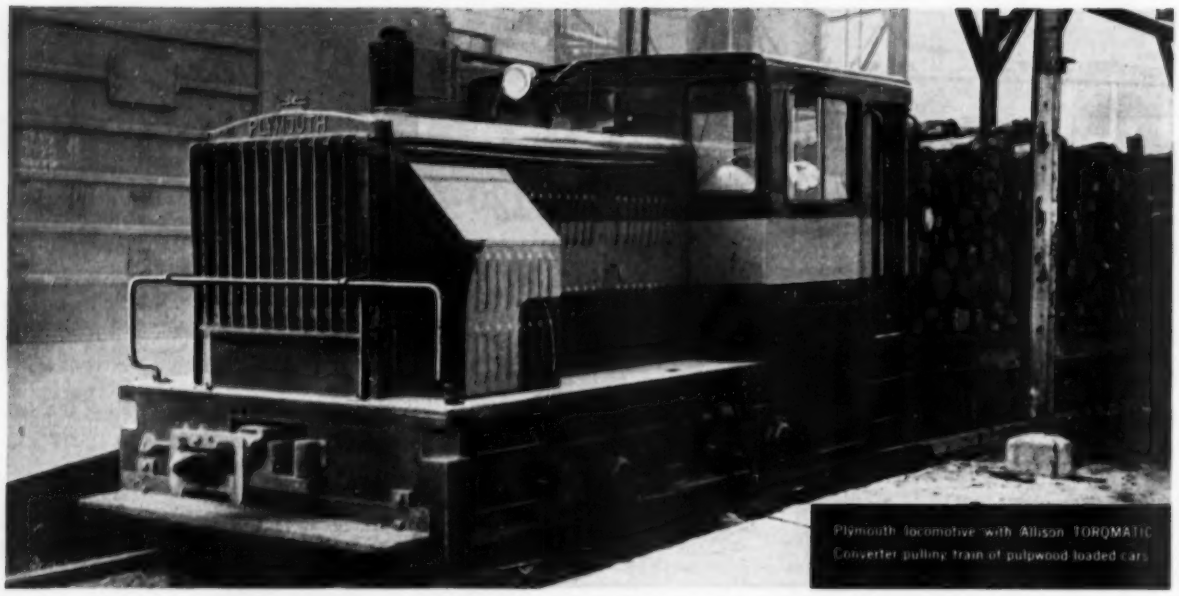
Operating benefits include reduced battery cycling, long battery life, and a simplified electrical system with sustained voltage—at no sacrifice in ruggedness or dependability. Specify Delco-Remy electrical equipment on all of your new buses.

Regulator

Delco-Remy

DIVISION, GENERAL MOTORS CORPORATION, ANDERSON, INDIANA

WHEREVER WHEELS TURN OR PROPELLERS SPIN



Plymouth locomotive with Allison TORQMATIC Converter pulling train of pulpwood loaded cars

Shock-Free Power Transmission Saves $500 a month

PRODUCTION jumped almost 100% when, in December 1950, *one* 18-ton locomotive equipped with an Allison Torque Converter replaced *two* 12-ton trolley-type locomotives owned by West Virginia Pulp and Paper Company.

Immediate savings came to $500 a month — the cost of a locomotive coupler. The trolley-type locomotives damaged an average of one coupler each month but smooth power transmission by the Allison TORQMATIC Converter eliminated this replacement expense.

And by November 1953, *savings in couplers alone* paid for a second Allison TORQMATIC-equipped locomotive.

Maintenance on these two units is "practically nil" because the Allison Converter automatically matches engine power to load demand, prevents engine lugging and drive-line shocks. Each unit uses less than 1 gallon of Diesel fuel an hour, pulls trains up 4½% grades, works an average of 16 hours per day.

Savings on Other Types of Heavy-Duty Equipment

Allison TORQMATIC Converters and TORQMATIC DRIVES cut costs and boost production in a wide range of heavy-duty equipment.

An Arizona mine gets 41% longer tire life on big truck tires costing $1000 or more each.

A Pennsylvania dragline operator saves $2160 a year on cable alone.

A western contractor gets 100% longer transmission life on off-highway trucks.

Get full details on TORQMATIC Converters, DRIVES and BRAKES for your units from your equipment dealer, manufacturer or write direct.

Allison Division of General Motors
Box 894D, Indianapolis 6, Indiana

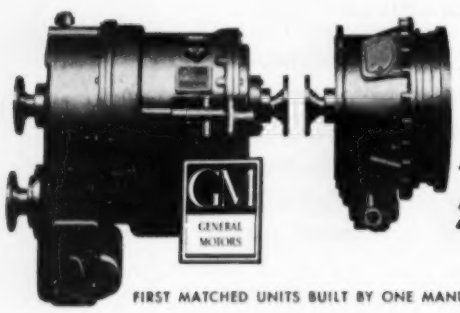
ALLISON TORQMATIC CONVERTER

Simple Design — one-piece cast converter elements — minimum maintenance

Compactness simplifies installation

Designed for power application in the 40 to 400 h.p. range

Longer Equipment Life — absorbs shock, eliminates engine lugging, cuts maintenance cost.



FIRST MATCHED UNITS BUILT BY ONE MANUFACTURER

Allison
TORQMATIC DRIVES

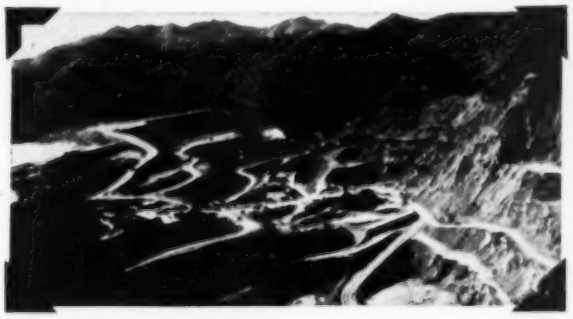
COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES
TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS

THE ENGINEER'S REPORT

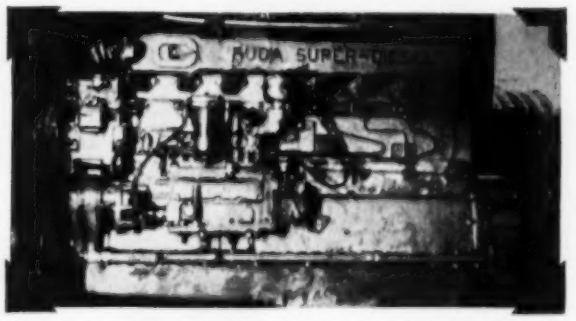
DATA

LUBRICANT	RPM Delo Oils
UNITS	21 Buda diesel engines
OPERATION	Hauling ore
CONDITIONS	Heavy duty — 8-15% grades
PERIOD	6 years
FIRM	Bagdad Copper Corp., Bagdad, Arizona

No stuck rings in 21 engines in 6 years hauling ore!

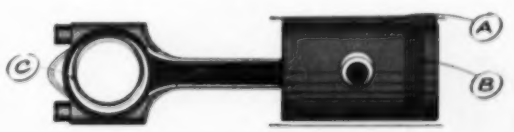


HAULING 22-TON LOADS up 8 to 15% grades out of the Bagdad Copper Corp. open-pit mine, 21 Buda diesels have had no stuck rings, no clogged ring grooves since using RPM DELO Special Lubricating Oil for the last 6 years. Engines operate 2 shifts a day, 6 days a week in heavy abrasive dust. Torn down after 7000 hours, all parts in the engine above were exceptionally clean and all bearings were good.



BIGGEST OFF-HIGHWAY TRUCK IN THE WORLD (above) was recently built for Bagdad Copper Corp. It weighs 96,000 pounds, hauls 75 tons. RPM DELO Special Lubricating Oil was also selected for its two 350 H.P. supercharged Buda diesels because of the excellent service Bagdad has had from this oil.

How RPM DELO Oils keep engines clean and prevent wear



A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.

C. Special compounds stop corrosion of any bearing metal, and oil foaming in both wet and dry sump engines.

There is an RPM DELO Oil to meet every heavy-duty engine operating condition.
FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

RPM DELO LUBRICATING OILS

TRADEMARKS "RPM DELO" REG. U.S. PAT. OFF.

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

New York Harbor Giant Can Hurl Two Tank Cars of Water a Minute ...*Over Two City Blocks*

New York's newest fireboat packs more diesel power than any fireboat ever built. Its huge pumps, independently driven by two of the four ENTERPRISE one-thousand horsepower diesel engines, are capable of throwing in excess of 14,000 gallons of water a minute... at 150 pounds nozzle pressure!

The other two ENTERPRISE Diesels provide a completely separate source of power for propulsion... insuring quick-acting maneuverability at all times.

More and more, ENTERPRISE Diesels are the choice of power experts for sustained dependability and performance. For every heavy-duty marine and stationary application, specify ENTERPRISE. Units to 2700 hp.

The 130 foot "John D. McKean" uses four 1,000 hp ENTERPRISE *Diesel Engines—two for pumping, two for propulsion.*

Enterprise
ENGINE & MACHINERY CO.
Diesels

18th and Florida Streets
San Francisco 10, California

ENTERPRISE ENGINE & MACHINERY CO.
A Subsidiary of GENERAL METALS Corporation
Boston • Chicago • Denver • Kansas City • Los Angeles
Minneapolis • New Orleans • New York • San Diego
San Francisco • Seattle • St. Louis • Washington, D.C.
DIESEL ENGINES • OIL BURNERS • PROCESS MACHINERY

Random Thoughts from a Filter Engineer

by Frank Purvis

- **KEEPING EFFICIENCY HIGH AT LOW AIR FLOWS**
- **PENNY WISE AND POUND FOOLISH**
- **HELP FOR THE ABSENT-MINDED**

KEEPING EFFICIENCY HIGH AT LOW AIR FLOWS

Unfortunately, it is true that efficiency of oil bath filters will decrease with the lowering of air velocity. In fact, at low air flows, some filters won't work at all. That's because there's not enough oil in motion to provide the vigorous scrubbing action needed to keep efficiency high.

We at Air-Maze have devised a way to minimize the drop in efficiency. Our oil bath filter assures thorough washing action at the lowest air velocities. How do we do it? A patented oil recycling method makes oil available at low flows so that the element continues to get a wash even when the engine is running at 10 to 15% of capacity.

Air-Maze oil bath air filter

Besides keeping the efficiency high when the air flow is low, our oil bath filter has another safety feature we feel is important. When the engine is shut off, the oil acts as a seal against air and moisture.

PENNY WISE AND POUND FOOLISH

We doubt if any owner of a new $5,000 Cadillac would shop around for the cheapest oil just to save a few pennies. Cheap oil can ruin delicate working parts. Why endanger a big investment for pennies?

Yet, we've always been a little amazed to see owners of $150,000 diesel engines shop around for the "cheapest oil" by buying air filters on the basis of price alone—instead of *protecting* their expensive investment with the best oil-bath air filter money can buy. Some diesel owners often forget that it takes only a little dirt in the air intake to cause a lot of damage to highly polished diesel parts such as rings, ring grooves and liners.

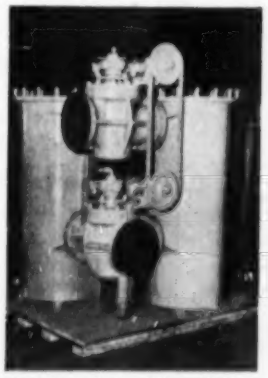
We're reminded of an advertisement we saw sometime ago which makes this point rather neatly. It said: "You can't afford to buy the cheapest! Buy the best and save!" We think there's a lot of good old-fashioned horse sense here.

HELP FOR THE ABSENT-MINDED

Here's a boon for forgetful people. Our new duplex lube oil filter for marine and stationary diesels makes it physically impossible to shut off the oil supply to the engine when cleaning the filter. Thus, it completely eliminates the danger of delicate diesel parts burning out due to lack of lubrication.

It has two parts—each a separate filter. They're connected by a chain linkage so that when one filter is turned off for cleaning, the other one is automatically opened. No shut downs necessary for filter maintenance.

This filter has more than a special safety control. It's a glutton for dirt. It stops damaging particles as small as .0032" and handles 360 gpm. at normal lube pressures up to 100 psi. It filters at high flows by using multiple cartridge assemblies, providing an exceptionally large filtering area. And drain plugs near the bottom of the filter shell easily drain off sludge contaminate.



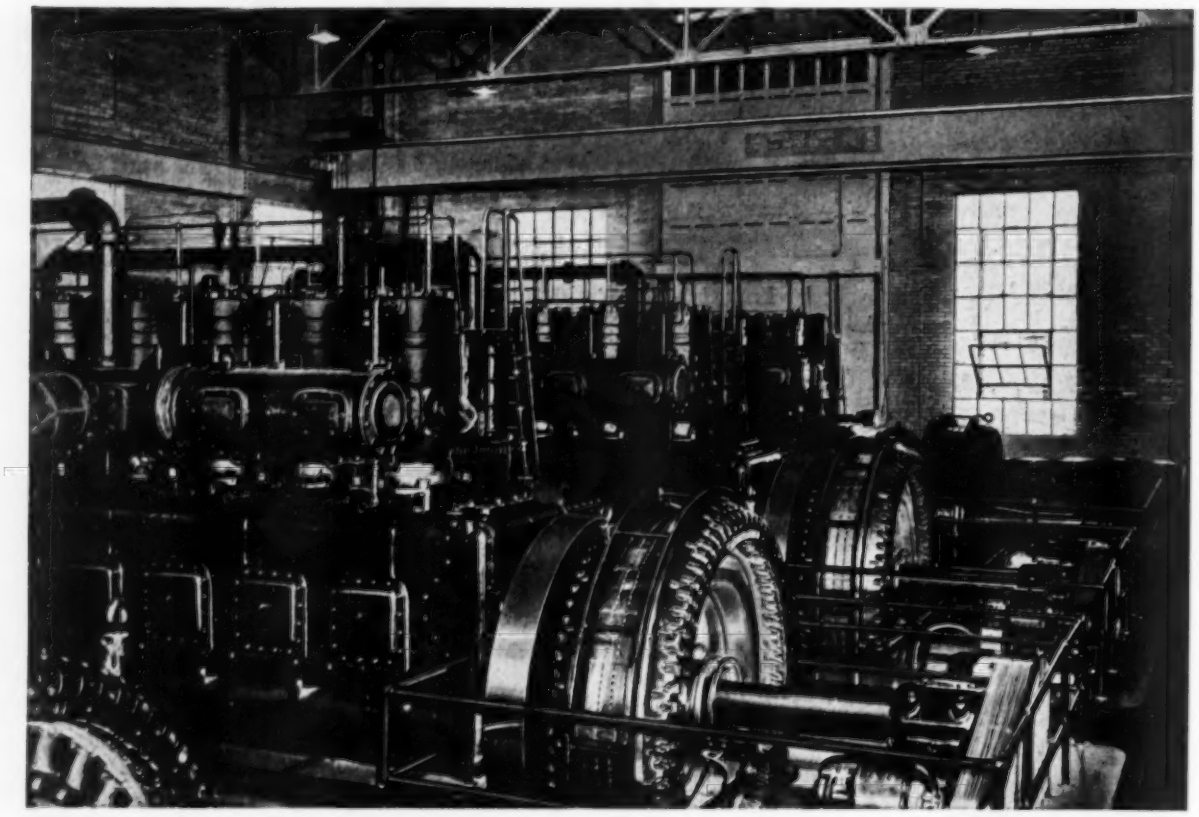
Air-Maze duplex lube oil filter

All in all, we think this is quite a filter. It readily met the exacting requirements of a large insurance company. If you're in the market for a better lube oil filter, why not look at this one?

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS



"We're Proud of This Plant!"

says Don H. Decker, — Plant Supt., Thumb Electric Cooperative, Ubly, Mich.

Manager Orville Hurford and Mr. Decker are justifiably proud of their 4-diesel engine generating station. The plant has been an outstanding financial success since the day it was first opened. Several times it has occupied #1 position on the REA Running Plant capacity chart.

Mr. Decker writes, "A large part of our operating success we attribute to Sinclair GASCON® D oil. It has given us an excellent rate of consumption while reducing wear. In fact, *cylinder and piston ring wear is much below normal based on other plants of equal capacity*. Something else we appreciate is the timely visits of the Sinclair Lubrication Engineers."

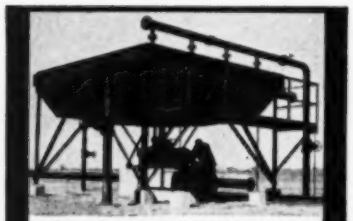
Top quality lubricants plus the assistance of Sinclair Lubrication Engineers are two of the reasons why Sinclair can play a large part in the success of *your* operation. Your local Sinclair Representative will be happy to explain the remaining reasons. Phone him or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

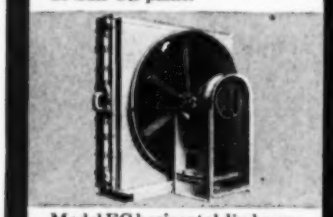
save Wear and Replacement

Now! Cut down on shutdowns with Trane Fluid Coolers!

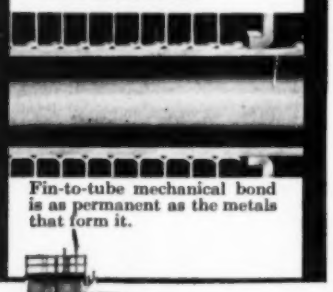
Lick vibration failure...reduce maintenance three ways



Close-up of model GC vertical discharge TRANE Fluid Cooler at Sun Oil plant.



Model EC horizontal discharge TRANE Fluid Cooler.



Fin-to-tube mechanical bond is as permanent as the metals that form it.

Downtime can be turned into operating time when you install TRANE Fluid Coolers, used by nation's leading oil and gas companies because they last longer, need less maintenance. Here's why...

Design protects coil from all vibration ... Motor and balanced fan mounted *independently* of rest of unit. Fin and tube mechanically bonded for life. No solder to loosen—no thin radiator tank. Header *floats* in casing to reduce stress on tube-to-header rolled joint.

Maintenance downtime cut three ways ... **1.** Removable header plate lets you get at tubes quickly. Round tubes easier to rod out. **2.** Single tube can be relined or plugged without removing entire core section. **3.** Plate type fins stay cleaner longer, are easier to clean.

No extra bracing needed ... Rugged steel framework engineered to withstand wind and earth shock. Field assembly is simplified. Cooler operates as designed ... the *first* time—*all* the time.

Automatic controls save power ... Two-speed motor and automatic shutters over coil permit close control for maximum power savings.

Get all the facts today ... Call your TRANE Sales Office or write TRANE, La Crosse, Wis., for Bulletin DS-395 containing capacities, performance curves, construction details, roughing-in dimensions, installation data and specifications.

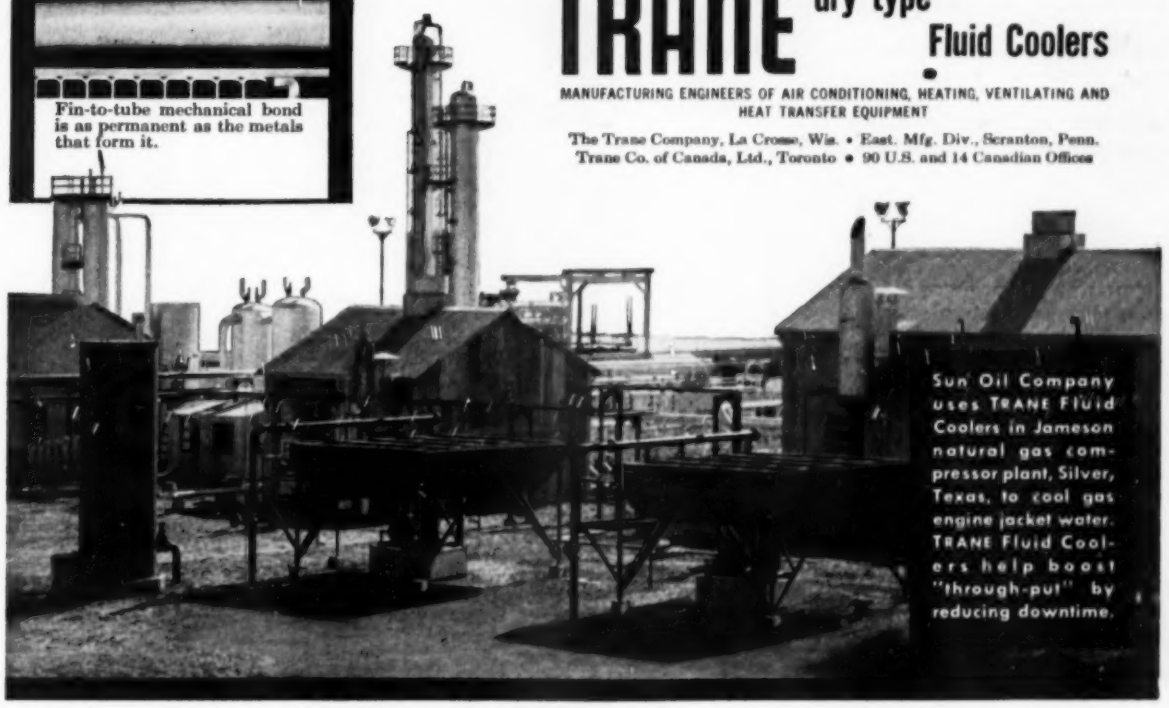
Typical users include Atlantic Refining Co.; Cooper Bessemer Corp.; Nordberg Mfg. Co.; Shell Oil Co., Refinery Division; Wolverine Pipe Line Co.

For lower operating cost ... less downtime ... specify

TRANE dry type **Fluid Coolers**

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 14 Canadian Offices



Sun Oil Company uses TRANE Fluid Coolers in Jameson natural gas compressor plant, Silver, Texas, to cool gas engine jacket water. TRANE Fluid Coolers help boost "through-put" by reducing downtime.

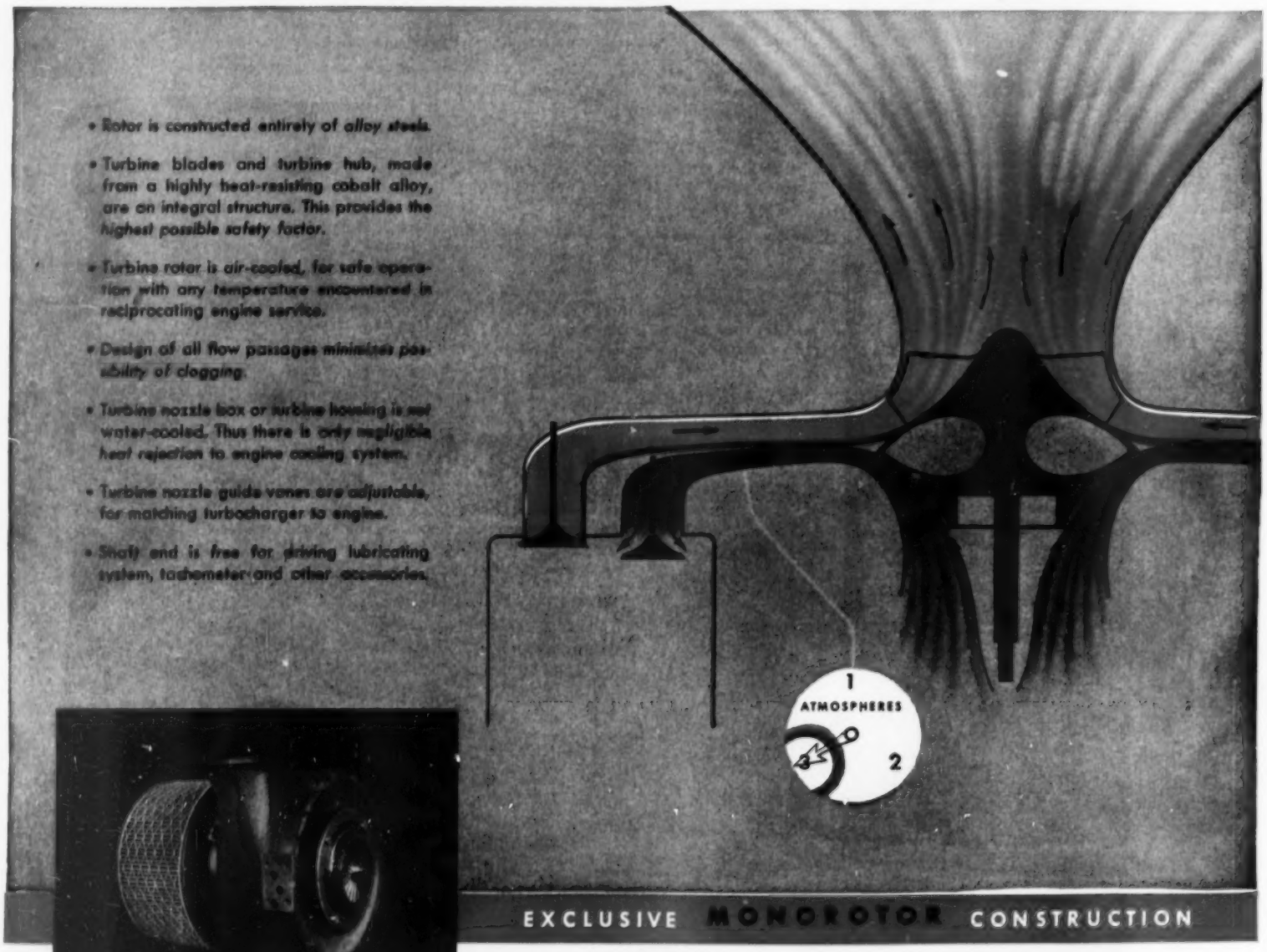
New DE LAVAL TURBOCHARGER *offers highest pressure ratios and efficiencies*

De Laval Turbochargers for diesel engines utilize a radically new design principle.

As a result of the Monorotor construction shown here, these De Laval units are capable of producing pressure ratios of 3:1 for continuous full-load operation of the engine and higher for engine overload ratings. Compressor and turbine efficiencies are extremely high.

Other Monorotor advantages are exceptional simplicity, comparatively few parts and light weight, in spite of very rugged construction.

Write for specification data on your application.

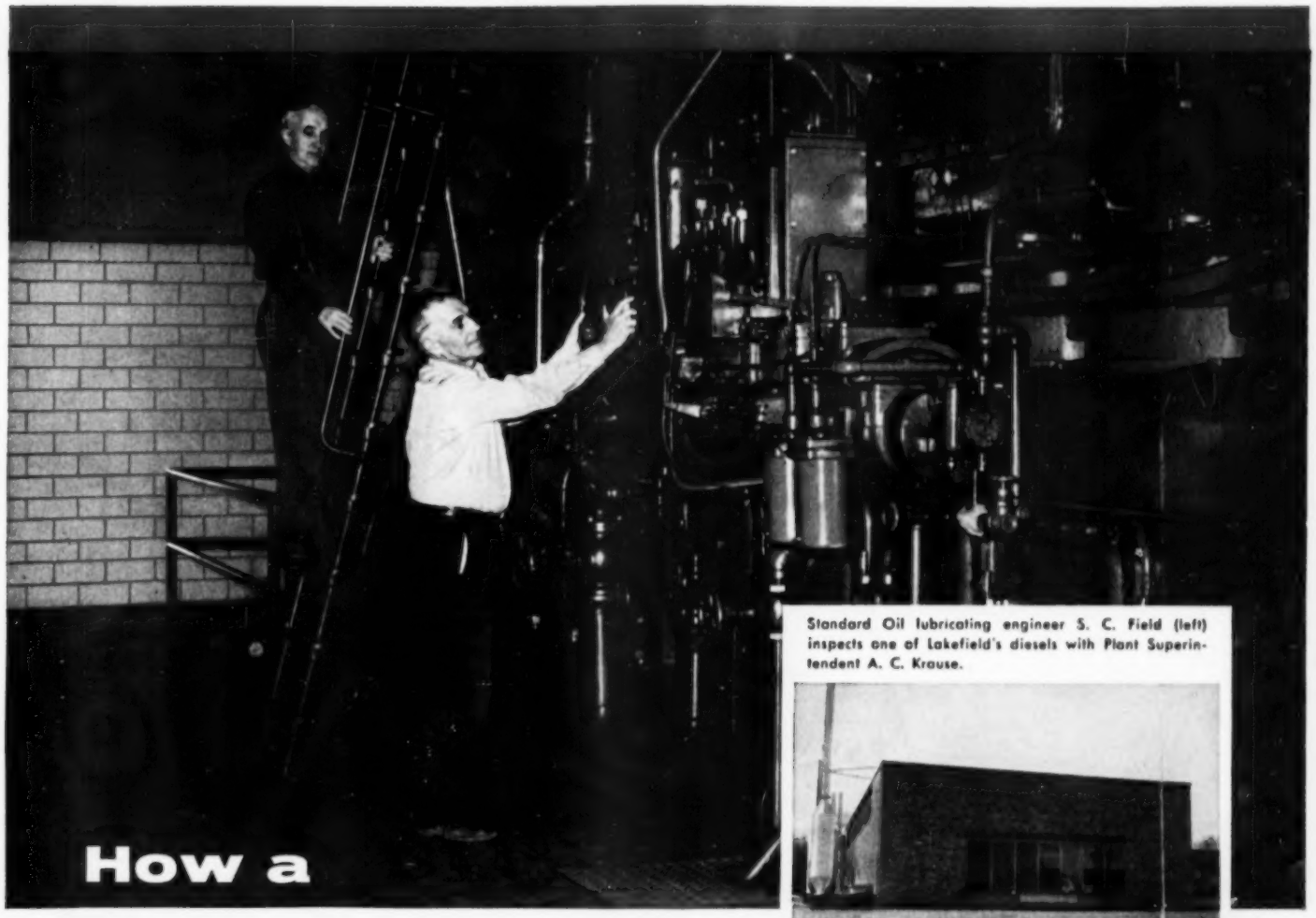

• Rotor is constructed entirely of alloy steels.
• Turbine blades and turbine hub, made from a highly heat-resisting cobalt alloy, are an integral structure. This provides the highest possible safety factor.
• Turbine rotor is air-cooled, for safe operation with any temperature encountered in reciprocating engine service.
• Design of all flow passages minimizes possibility of clogging.
• Turbine nozzle box or turbine housing is not water-cooled. Thus there is only negligible heat rejection to engine cooling system.
• Turbine nozzle guide vanes are adjustable, for matching turbocharger to engine.
• Shaft end is free for driving lubricating system, tachometer and other accessories.
1
ATMOSPHERES
2
EXCLUSIVE MONOROTOR CONSTRUCTION

This is one of 4 sizes of De Laval B-Type Turbochargers

DE LAVAL *Turbochargers*

DE LAVAL STEAM TURBINE COMPANY

883 Nottingham Way, Trenton 2, New Jersey



Standard Oil lubricating engineer S. C. Field (left) inspects one of Lakefield's diesels with Plant Superintendent A. C. Krause.

How a "sightseeing" tour solved our lubrication problem!

• A few years ago the diesels supplying power for the Public Utilities Plant, Lakefield, Minn. needed frequent cleaning and overhauling and still did not operate at rated capacity. Ring-sticking and deposits were persistent. Several oil switches failed to make any improvement.

Then a Standard Oil lubrication engineer took the Lakefield superintendent on a visit to other nearby plants where similar problems had been successfully licked. In these plants all engines were running on STANDARD HD Oil. In all cases rings were found to be free—deposits completely absent.

Soon after this "sightseeing" tour, one of the Lakefield engines was test-run on STANDARD HD. In less than six months it was thoroughly cleaned up and running at rated capacity. Naturally, Lakefield's other diesels were all switched to STANDARD HD Oil soon after and have been running trouble-free ever since.

If you've got a lubrication problem and would like to see how other plants licked the same kind of trouble, check with your nearest Standard office. Or write to Standard Oil Company, 910 S. Michigan Ave., Chicago, Illinois.

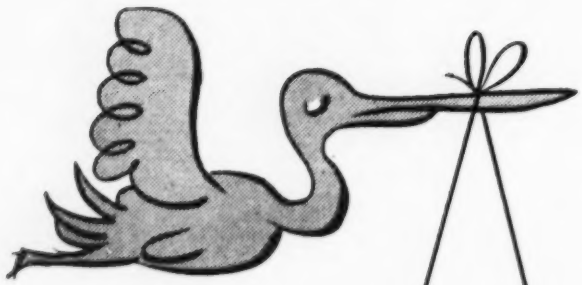
STANDARD HD
TRADE MARK
OIL

STANDARD HD Oil keeps engines running better. It's specially made to minimize wear in vital operating parts . . . keeps engines operating at peak efficiency by keeping engines clean. Try some today and see why more and more midwest plants are running better on STANDARD HD Oil.

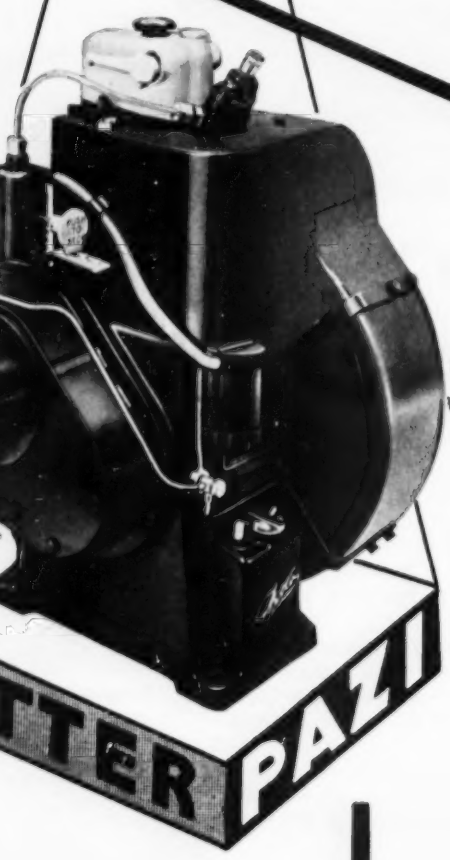
STANDARD OIL COMPANY

STANDARD (Indiana)

A NEW ARRIVAL



To the Petter air-cooled diesel engine family



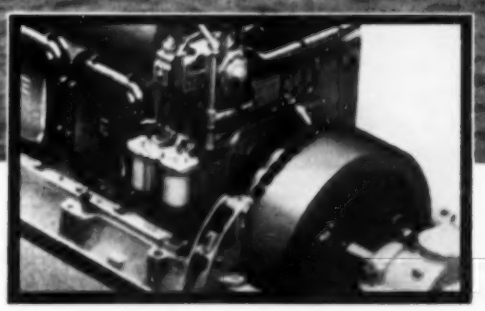
1½ & 2½ H.P.

Range NOW 1½ - 40 H.P.

BACKED BY A WORLD-WIDE PARTS AND SERVICE ORGANISATION FOR THE 360,000 ENGINES IN USE

WRITE FOR INFORMATION
A FEW CHOICE DISTRIBUTORSHIPS OPEN

THE PETTER SMALL ENGINE DIVISION OF BRUSH ABOE, INC.
Office and Showroom 60-07 39th AVE. WOODSIDE, NEW YORK



The John D. McKean, New York City's newest fireboat, is powered with four 1,000-bhp Enterprise diesels—two propulsion; two pumping. All four are power-protected with Purolator Fuel Filters.

Dirt in fuel *no cause for alarm here!*

SEAGOING fuel tanks are notorious collectors of contaminants . . . sand, sediment, rust, and just plain nuts and bolts. These are deadly enemies of engines, and it pays to get rid of them *before* they cause trouble!

On New York City's fireboat, *John D. McKean*, fuel contamination is no worry! All four propulsion and pumping Enterprise diesels are equipped with Purolator D11322 Fuel Filters . . . used on many other well known engines, too. Purolator* Metal Edge Fuel Filters—equipped with corrosion-resistant brass, monel or stainless steel elements —are available in sizes from ¼ in. to 15 in. diameter. Element spacing can be supplied to your requirements, from .001 in. to .025 in.

Whenever your problem is filtering, our Engineering Department can help you solve it. Write for the newest *Purolator Industrial Catalog* . . . your guide to the best in filtration equipment.

*Reg. U. S. Pat. Off.

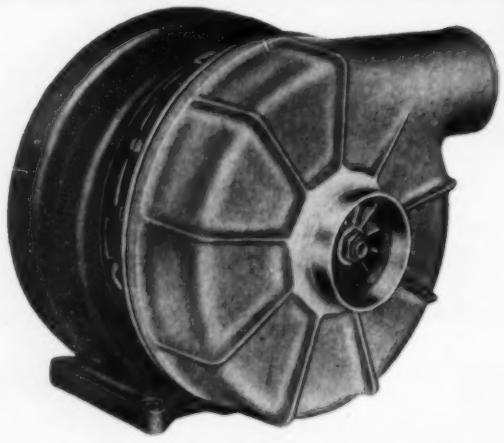
PUROLATOR
WORLD'S FINEST OIL FILTER

PUROLATOR PRODUCTS, INC., Rahway, New Jersey, and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles

SCHWITZER-CUMMINS COMPANY

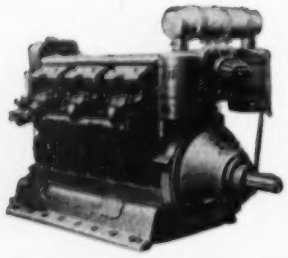
Superchargers

POSITIVE DISPLACEMENT AND TURBO SUPERCHARGERS FOR INTERNAL-COMBUSTION ENGINES

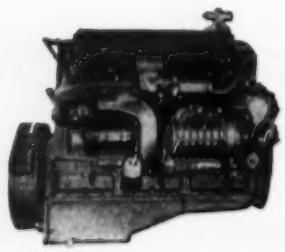


EXHAUST DRIVEN TURBOCHARGERS
for engines 40 to 400 brake horsepower, naturally aspirated.

POSITIVE DISPLACEMENT SUPERCHARGERS for engine sizes from 50 to 500 HP, and pressure ratios of 2:1 max.



Model D-375—Caterpillar Diesel V8



Model HRBS-600
Cummins Engine Company, Inc.
(Used also on HBS Series)

For over a quarter of a century SCHWITZER-CUMMINS SUPERCHARGERS have received widespread recognition throughout the industry for their reliability, economy and unexcelled performance.

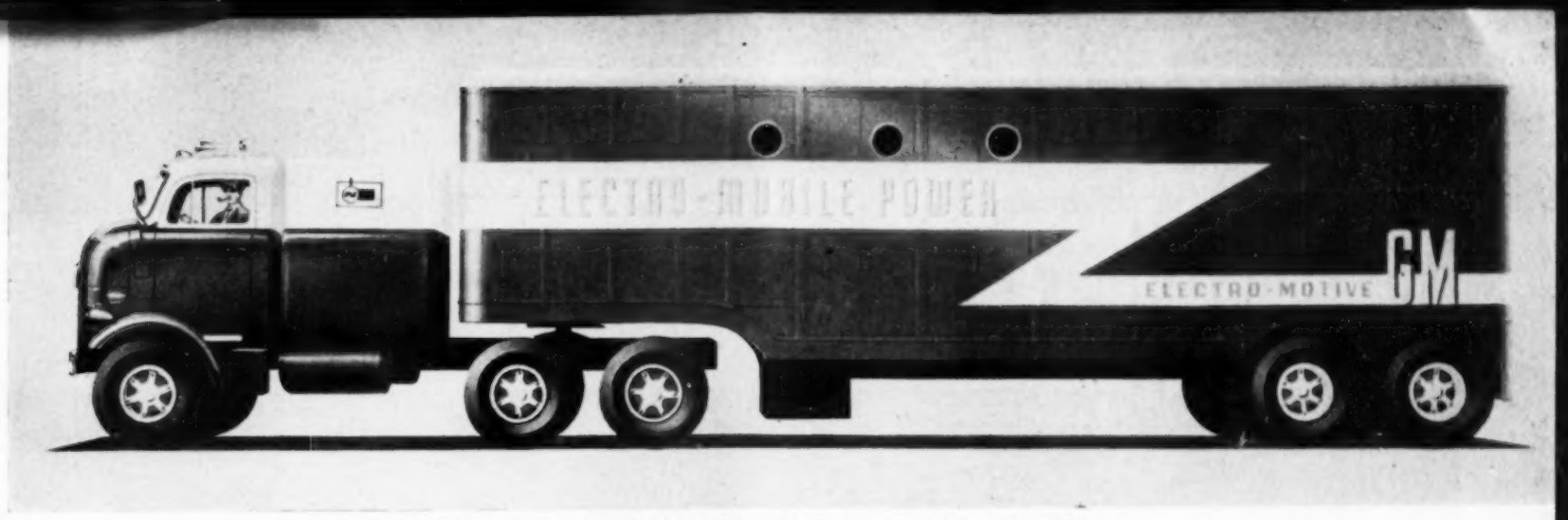
Superior engineering and skillful workmanship, backed by a multi-million dollar investment in up-to-date facilities, teamed up to develop this excellent product so that it is today first choice of leading internal combustion engine manufacturers.

SOME FAMOUS ENGINES SUPERCHARGED BY **SCHWITZER-CUMMINS**
CUMMINS • CATERPILLAR • MACK INTERNATIONAL • HERCULES • WAUKESHA • INGERSOLL-RAND • HARNISCHFEGER and OTHERS

OTHER PRODUCTS

- COOLING FANS
- AIR STARTING MOTORS
- THERMOSTATICALLY CONTROLLED FAN DRIVES
- OIL PUMPS
- WATER PUMPS
- CRANKSHAFT VIBRATION DAMPERS
- AUTOMATIC SHAFT SEALS
- PUMPS FOR AUTOMATIC TRANSMISSIONS AND POWER STEERING

SCHWITZER-CUMMINS COMPANY
1125 MASSACHUSETTS AVENUE
INDIANAPOLIS 7, INDIANA, U.S.A.



To assist utility companies in protecting and improving service in outlying areas and to restore power quickly in emergencies, Electro-Motive Division of General Motors has designed and built this first fully integrated, mobile diesel-electric generating unit of 350 and 500 kw. capacity for use over the highway. Unit can be multiplied to provide any desired capacity.

INTERIM BOOSTING FOR PUBLIC UTILITIES FOR FRINGE AREAS AND EMERGENCIES

A New Concept in Mobile Generating Equipment

By Bruce Wadman

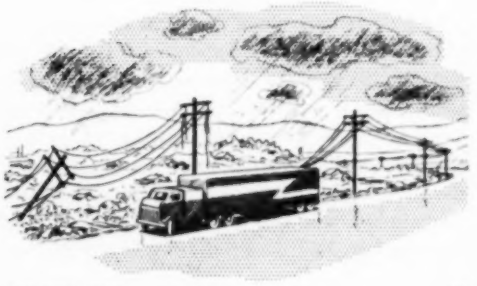
La Grange, October 12, 1954—

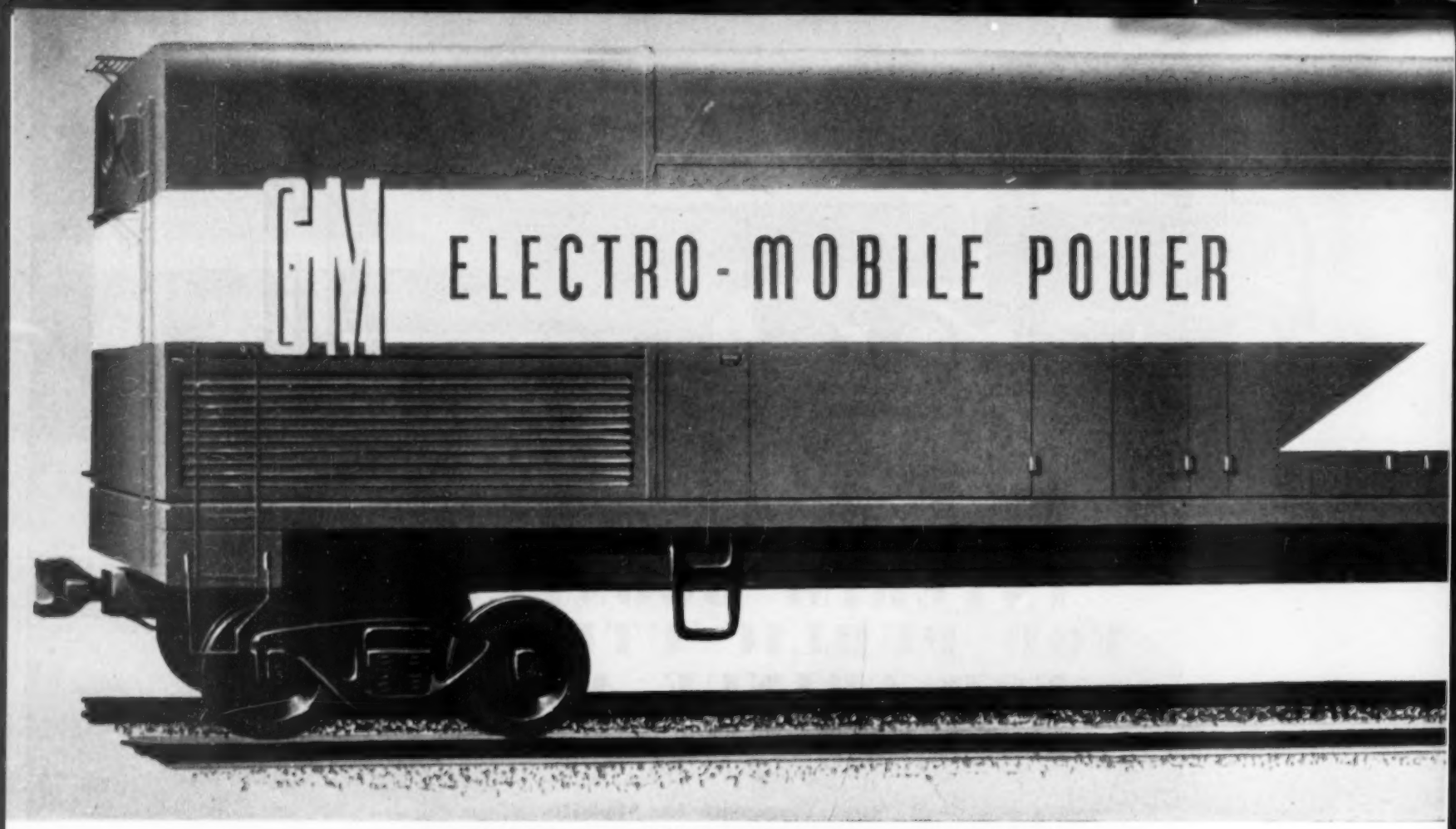
DEVELOPMENT of a new type of mobile electric power generating plant designed to help utilities to meet difficult problems in public service growing out of the increasing migration of population and industry from populous centers to far outlying territory was announced today by Electro-Motive Division of General Motors here at La Grange, Ill.

The new units are designed to meet what utility engineers call "fringe area interim boosting." This consists largely of meeting unusual demands for current which are either so seasonal, so temporary, or so low in load factor that it is not economic to extend either an original power line or a second line for protection. "The new units offer the utilities an opportunity to save hundreds of millions of dollars," said N. C. Dezendorf, vice president of General Motors and general manager of Electro-Motive Division. Electro-Motive is ready to mass produce the new machines at its La Grange plant.

Five models of the new "Electro-Mobile Power Units" were disclosed to officials of approximately 100 of the leading public utilities of the United States at the La Grange Electro-Motive headquarters today. Three are designed to be moved over railroads and two for movement over highways. The railroad units are of 500, 750 and 1,000 kilowatt capacity. The highway units are of 350 and 500 kilowatt capacity. The units may be as rapidly coupled together as the units of a standard General Motors diesel locomotive so any desired capacity may be obtained from a single 350 kilowatt highway unit or 500 kilowatt rail unit to whole highway fleets or long trains of railroad units totaling, for instance, a hundred thousand kilowatts or whatever is necessary to put an average American city back into operation after a disaster of war or nature. Pilot models of the 500 kilowatt highway unit and of the 1,000 kilowatt railroad unit were demonstrated for the

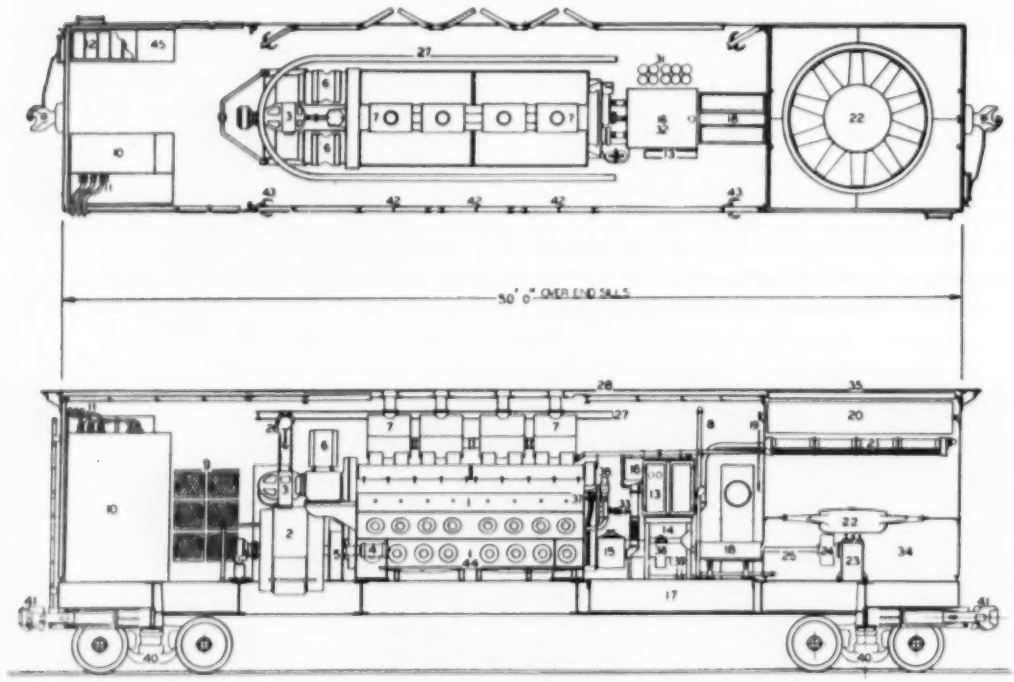
The EMD "Electro-Mobile" 500 kw. generating plant. It is shown without carbody. Pictured are switchgear cabinet, new high efficiency ac. generator, 800 hp. diesel and cooling system.





View of the 1000 kw. "Electro-Mobile," diesel-electric generating unit designed and built by EMD for public utility use. The unit, which can operate from railroad sidings or placed on piers for long-term operation, is available in 350, 500, 750 and 1000 kw. capacities.

Equipment arrangement of the 1000 kw. "Electro-Mobile" car shown above.

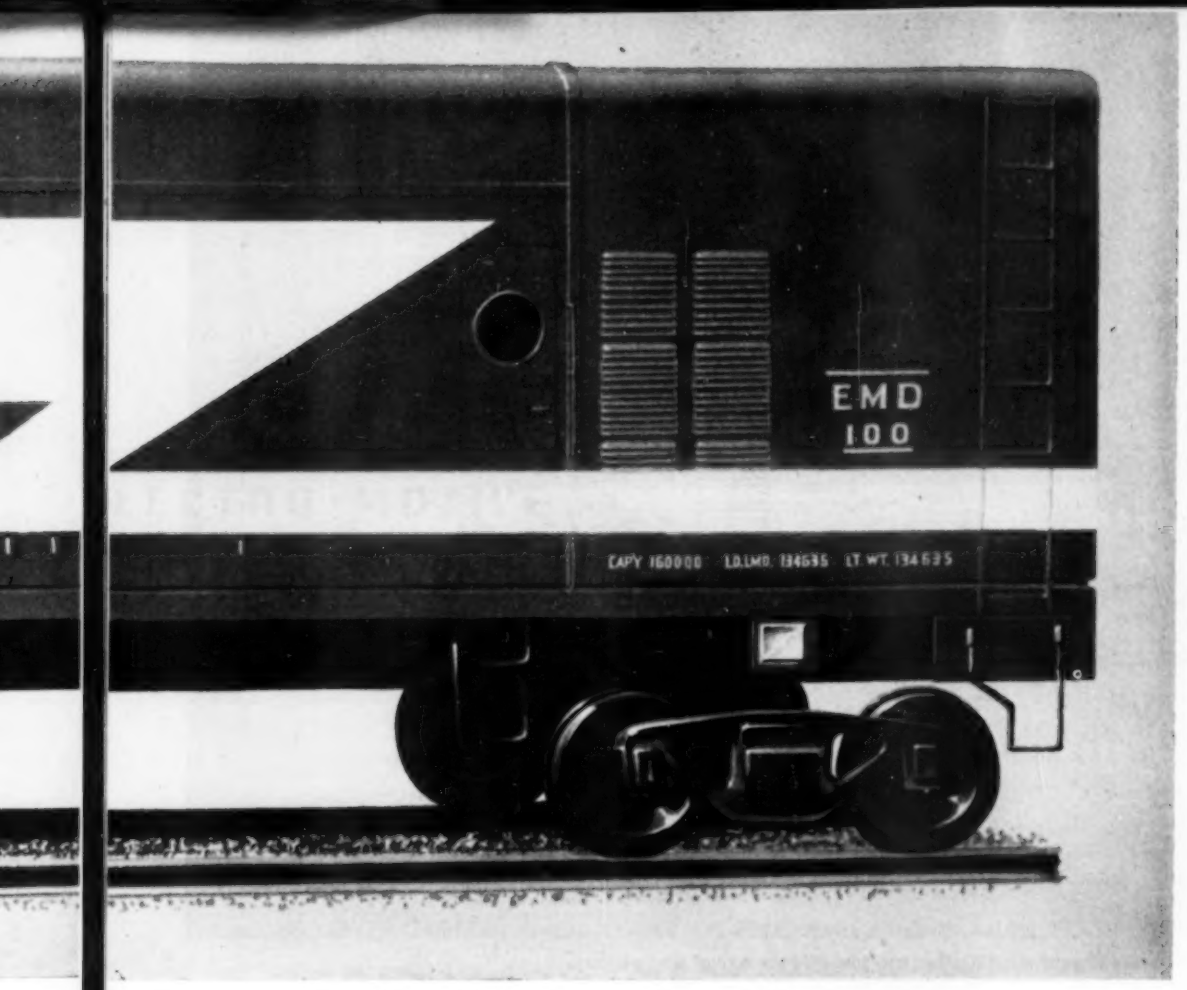


1 ENGINE E.M.D. MODEL 16—567—C
2 SYNCHRONOUS GENERATOR
3 EXCITER
4 STARTER
5 FLYWHEEL GUARD
6 ENGINE AIR INTAKE FILTER
7 EXHAUST MANIFOLD
8 FUEL VENT PIPE
9 ENGINE ROOM FILTERS
10 ELECTRICAL CABINET
11 POWER TAKE-OFF
12 BATTERIES
13 CONTROL CABINET & INSTRUMENT PANEL
14 ACCESSORY RACK
15 ENGINE OIL STRAINER
16 ENGINE WATER TANK
17 FUEL TANK—400 GAL.
18 DRIVE SHAFT GUARD
19 SHUTTER OPERATING ROD
20 SHUTTERS
21 RADIATORS
22 86" FAN
23 SPEED REDUCER ASSEM.
24 EDDY CURRENT CLUTCH
25 FAN DRIVE SHAFT
26 CHAIN HOIST—1 TON CAP.
27 CHAIN HOIST RAIL
28 ROOF WALKWAY
29 END LADDER
30 HAND BRAKE
31 LUB OIL FILTER
32 LUB OIL COOLER
33 WATER TEMPERATURE GAUGE
34 RADIATOR AIR INLET
35 RADIATOR AIR DISCHARGE
36 FUEL SUCTION FILTER
37 FUEL PRESSURE FILTERS
38 ENGINE GOVERNOR
39 MOTOR DRIVEN FUEL PRIMING PUMP
40 50 TON FREIGHT CAR TRUCKS
41 TYPE 'E' COUPLER
42 MAINTENANCE DOORS
43 ACCESS DOORS
44 ENGINE RAMPS
45 BATTERY CHARGER

utility officials. They will be loaned to utilities for try-outs on local problems on a coast-to-coast tour soon to start. The utility men also were shown four models of a new portable generating plant utilizing the same General Motors 567C diesel engine and other major components used in the mobile plants. The portable plants, on skids and capable of being put on railroad cars or truck trailers for transport, are designed for more permanent installations than the mobile plants. These portable plants are of 350, 500, 750 and 1,000 kilowatt capacity.

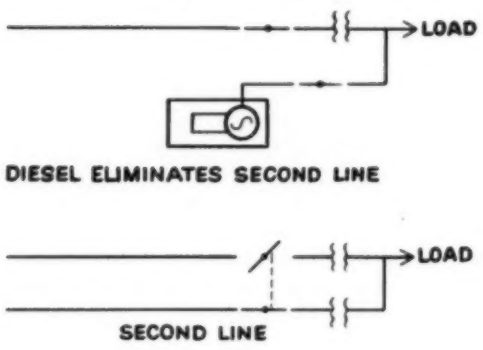
Major components of the new machines (such as diesel engines) are either already in production for use in General Motors locomotives, or are so closely related to other standard major components of diesel locomotives (such as generators and car structures) that existing production machinery, methods and labor at La Grange can be immediately switched to the new product. The new units represent the first offering to public utilities of a completely integrated, standardized mobile power plant of size large enough to meet the rapidly increasing expansion problems of the nation's larger public utilities out at the fringes of their far flung distribution systems.

"The design of these units is the direct result of approaches from public utility engineers who, some two years ago, asked Electro-Motive if it would be possible to apply to a mobile power unit the advantages of price, low operating cost, reliability and replacement parts availability existing in the GM diesel locomotive," said Mr. Dezen-



dorf. "The diesel locomotive is, in one sense, a travelling electric generating plant which uses up its own output. Our engineers found it was not difficult to build an alternating current generator in place of the direct current generator used in the diesel locomotive, to develop a proper cooling system, a car, less expensive trucks, and the kind of controls needed to meet utility requirements. In fact, so much less is required in the power units than in a locomotive that they can be sold at considerably less per kilowatt of capacity than the diesel locomotives.

For standby power requirements such as protection in storms or disaster and to postpone heavy investment in building of second line, these mobile diesel units provide the answer.

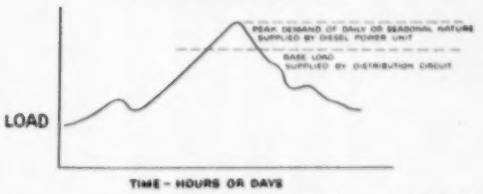


"We have produced at Electro-Motive and put into diesel locomotives over 19,000,000 kilowatts of capacity in our generators since 1938. This is the equivalent of one-sixth of all the installed electric generating capacity in the United States. The mass production methods and machinery that produced this output are now being placed at the disposal of the electric utility industry as well as the railroads. Production of new motive power and parts for the 16,000 units of General Motors diesel locomotives now in service in the United States, Canada, Mexico and many overseas countries will in no way be curtailed by the new activity." Electric utility companies long have recognized the need for a method of meeting low load factor demands for electrical supply in outlying or "fringe" areas. "These areas, mostly beyond the reach of existing grids, are costly to serve with either extension of an original line or construction of a protection line," Mr. Dezendorf added. "Yet, either for protection of a stake in the customer's future electrical requirements or for public relations reasons the utility is faced with the necessity of providing an adequate service in these fringe regions."

Among the power requirements faced by utilities in outlying areas, which the new units would help solve, he cited temporary or seasonal requirements such as providing electricity for summer or winter resort areas, expositions, carnivals, or other outdoor shows; power for large construction projects; or preserving service during line or sub-station rebuilds. Other important requirements are for standby power for use in emergencies such as occur during storms or disasters, and for what utilities call "peak skimming," or taking care of unusual loads which occur seasonally or during certain intervals of the day.

A new line of "A" series generators has been designed for use in the mobile and portable units featuring latest electrical and mechanical advancements growing out of Electro-Motive's experience as a very large builder of heavy duty electric traction equipment. The "A" line generators have been designed to withstand a 25 per cent overload and to operate at 4,160 or 2,400 volts. Utilizing silicone, glass and mica, these generators have improved insulation better fitted than any other known insulation to withstand the intermittent operation in varying weather conditions frequently found in fringe area, low load factor situations.

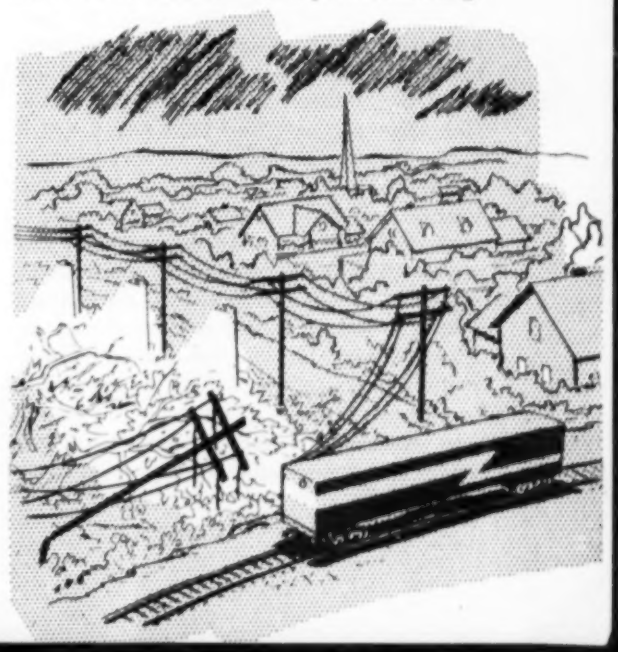
The mobile units provide capacity for peak skimming in areas far removed from the central station or where seasonal demands require it.

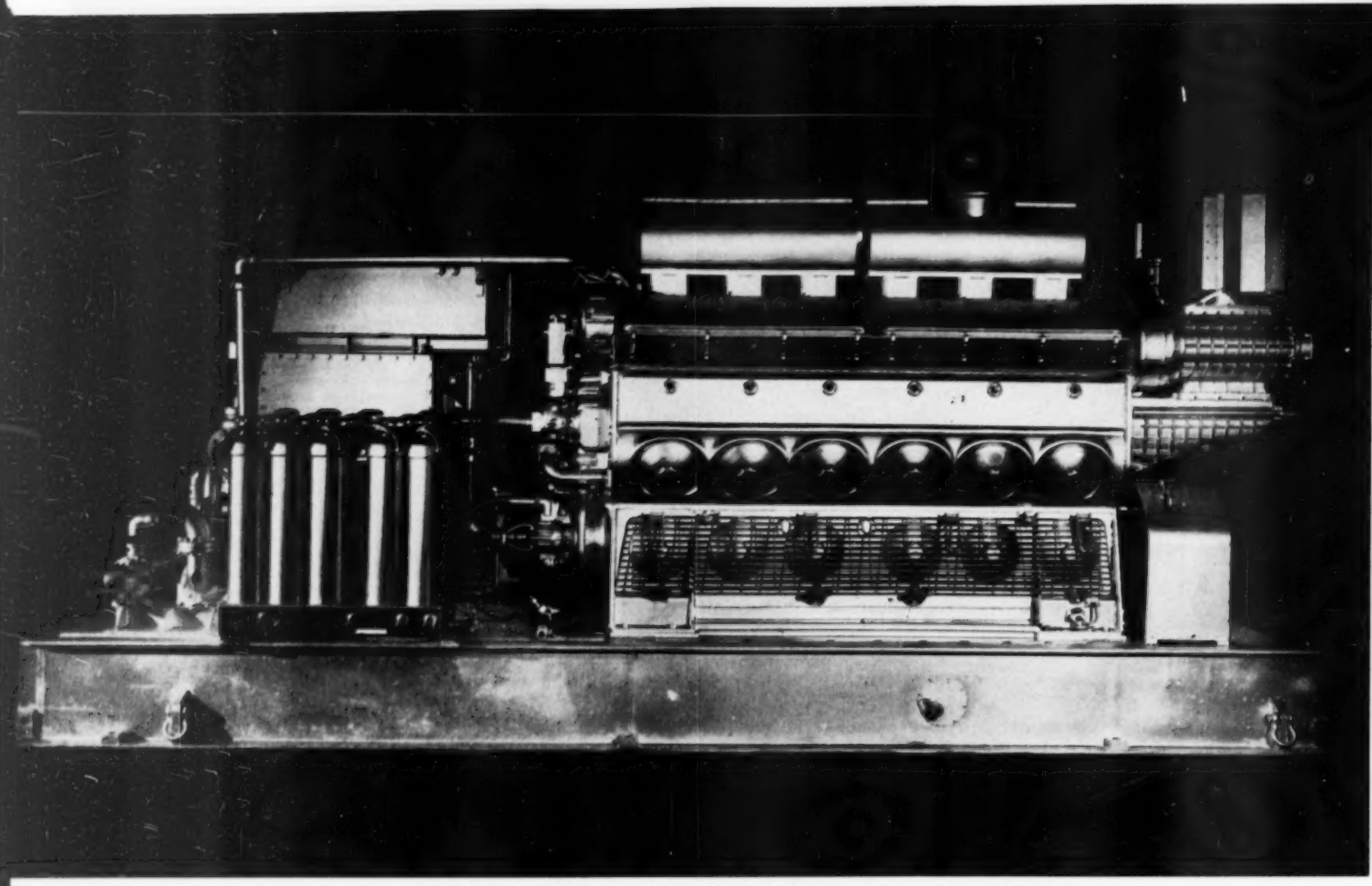

PEAK DEMAND OF DAILY OR SEASONAL NATURE SUPPLIED BY DIESEL POWER UNIT
BASE LOAD SUPPLIED BY DISTRIBUTION CIRCUIT
LOAD
TIME - HOURS OR DAYS

An outstanding feature of the "Electro-Mobile" units is availability of automatic control apparatus which makes these units completely self-operating at far outlying points. They can be controlled by a central operator, hundreds of miles away, by impulses over a wire or by radio, or they can be started or stopped by fluctuations in voltage on the line which they are serving. On receipt of a starting impulse, these controls will take the unit from a standstill to full load in less than a minute by a timed, fail-safe sequence. This starting impulse can be given by any of several devices such as radio, telephone, voltage relay, carrier current, or push button. Once the starting impulse is given, the engine automatically is cranked to start and accelerated to full speed of 720 revolutions per minute in approximately five seconds. The generator automatically is synchronized to the line—frequency, volts and actual phase—and the circuit breaker is closed in from five to 20 seconds. Within an additional 20 seconds, the generator is loaded to full load. Total time from starting impulse to full load is approximately forty-five seconds.

Discussing the mobile units housed in rail cars or highway semi-trailers, Mr. Dezendorf pointed out that Electro-Motive engineers have developed a special exhaust manifold for the diesel engines to meet the low noise level requirements for operation in residential areas. A further factor in reducing noise is use of perforated sound proofing material to line the entire carbody.

Editor's Note: Some details of the control equipment and the installation itself prove interesting.





The GM series 567C diesel engine—a 1200 hp. unit mounted on a rigid steel platform without generator for direct power take-off. It is available in 6-, 8-, 12- and 16-cylinder sizes for use with generators of comparable capacities.

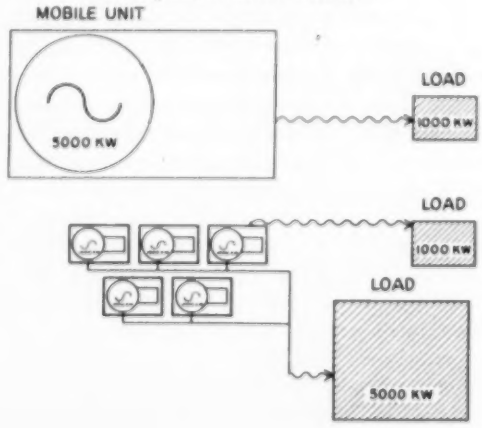
Starting is electric with a 120-volt system, and a Delco-Remy electric starting motor, going through a Bendix drive. Batteries supply the power to actuate the electric starter. The engine is started completely automatically by the push of a single button. The steps are as follows (bearing in mind that these all follow automatically without touch of human hands): 1. You press the starter button. 2. Engine starts and it is brought up to the correct speed. 3. Then the voltage is matched to the voltage of the line. 4. Then the engine generator synchronizes with the high line. 5. Then the governor adjusts to take the load prescribed or demanded. (This is an entirely automatic operation and all occurs within 45 seconds.) The engine will try to start itself three times automatically if there is something wrong, and then will shut down and won't start again.

Normal shutdown is achieved also by pressing a button and the governor unloads the engine gradually and then cuts out, shutting off the engine when the prescribed unloading period is finished. A setup for idling down the engine can be adjusted in the system to meet desired specifications. Automatic shutdown facilities consist of the following: Detroit Controls low lube oil pressure and high cooling water temperature alarms will trip the master relay switch and actuate the shutdown cycle of unloading the governor, etc. Also the electrical system, high voltage, over-current, shutdown controls will do the same thing.

The power car has plenty of room around the engine and equipment to permit easy access for normal maintenance operations. On top of this the following features are here: 1. A small removable hatch above the exhaust stack assembly permits access to that part of the engine. 2. For removal of major assemblies, like engine, generator, etc., the entire roof, from the fan department in the front to the switchgear room is removable and opens up the entire engine generator assembly. 3. There is a one-ton crane hoist circling the engine in the roof that facilitates removal of smaller assemblies like heads, liners, etc.

The radiator is located in a separate compartment in the front of the power car and consists of Harrison radiator elements in the roof. An aluminum fan in horizontal position, circulates air through the elements. This is driven through direct drive off the engine, through an eddy-current coupling, which is actuated by a Detroit Controls Vernatherm unit in the cooling water piping on the engine, through a series of solenoids, which control the eddy-current coupling and vary the speed of the fan to suit cooling conditions. The Vernatherm also actuates vents through a compressed air setup to adjust the cooling system also. The lube oil is cooled by the jacket water through a Ross heat exchanger in front of the engine. There is also a vent arrangement between the cooling room and main engine room that blows hot air in in the winter, and takes it out in the summer.

Available in blocks of capacity, they make possible covering average demands without overpowering and a consequent waste of investment.



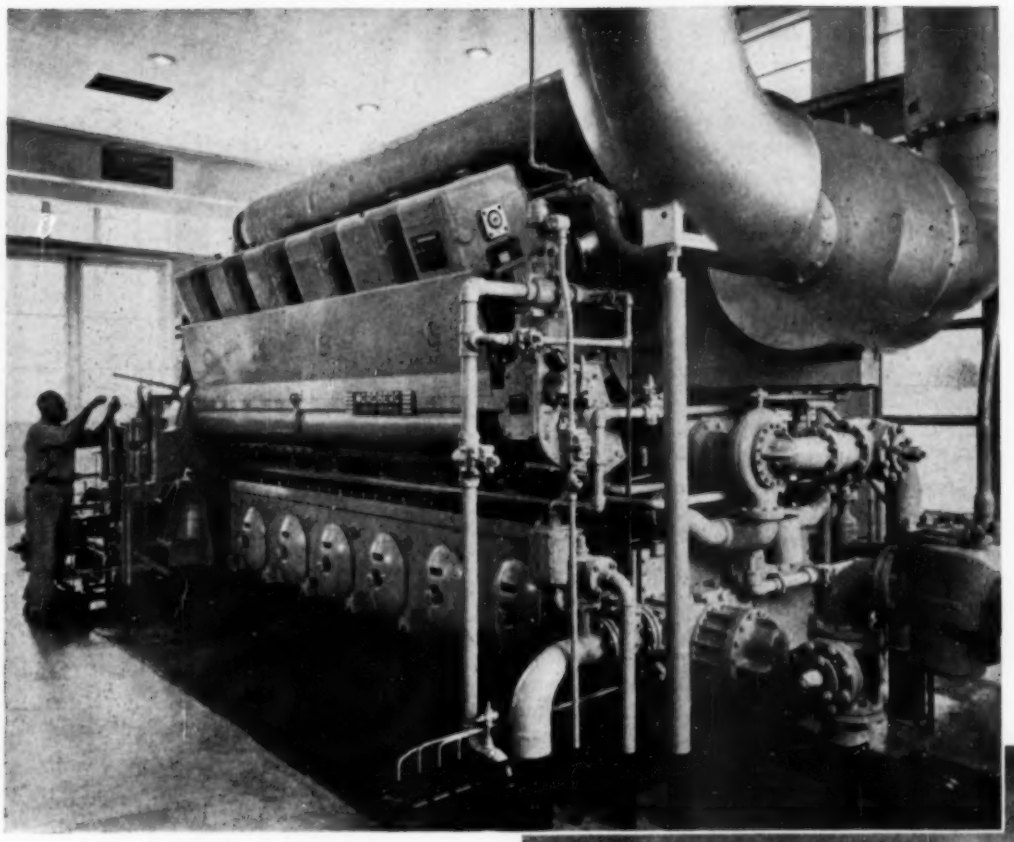
Optional equipment to keep the engine warm for starting in the cold weather, is a Vapor Heating Corp. heater which keeps the cooling jacket water warm and circulating while the engine is shut down between active services. The snubber is also equipped with a collar and plates to form a chimney effect to help draw heat away from the engine room also. The exciter is Delco, governor is Woodward UG8; oil filters, Michiana with ten elements.

The power car is 50 feet long. The back end contains the switchgear, and a complete instrument panel and operator cubicle if an operator is desired on the job. Then comes the main section or engine room. The front section contains the cooling system (fan and radiator coils). There are busses on both sides of the car for taking the power off, thereby eliminating the necessity of turning the car around for positioning, etc.

WOLVERINE PIPE LINE SYSTEM

New Products Carrier Combines Modern Design, Engineering Features

By DOUGLAS SHEARING



One of the Vicksburg station operators, Floyd V. Miller, adjusts a lever on the automatic starting system employed on the Nordberg engine. Note DeLaval Steam Turbine turbocharger upper right. This is the first opportunity we have had to show a DeLaval turbocharger in actual service. Full details of this high-pressure turbocharger were given in our June, 1953, issue of DIESEL PROGRESS and on pages 198-200 of Volume 19, DIESEL ENGINE CATALOG.

Good housekeeping and modern design characterize the Wolverine Pipe Line System.

THE new 295-mile Wolverine Pipe Line Co. 16-in. products carrier combines modern design and engineering features which are unique in the history of the pipe line industry.

Beginning at Hammond, Ind., the new line runs eastward to a point near Ann Arbor, Mich., where it branches into two segments, one continuing to Detroit and the other to Toledo, Ohio. It is a common carrier available to all shippers and subject to the regulations of the Interstate Commerce Commission. Its owners are Shell Oil Co., Cities Service Oil Co., and the Texas Co. The first company was in charge of design and construction.

The Wolverine System receives shipment of products through private feeder lines from the Cities Service Refinery, and the Shell and Texas terminals in nearby East Chicago. It delivers the various shippers' products to their terminals at Niles, Jackson and Detroit, Mich., and Toledo. With a current capacity of 4,000,000 gallons of petroleum products a day, the line is now being employed to transport diesel fuel, #3 fuel oil, premium and house brand gasoline, kerosene and prime white. The line capacity may be boosted to 7,350,000 gallons by adding more pump stations. Currently there are two pumping stations, one at Kennedy Avenue in Hammond and the other at Vicksburg, Mich.

The Kennedy Avenue station is the key operating point for the entire Wolverine System. Here two large, two stage United Iron Works pumps, each driven by a 1250 hp. electric motor at a speed of 3600 rpm., provide the initial pumping pressure for the line.

Control of operations is centralized in a separate building. Lights on a large control console indicate the position of all tanks, valves, meters and pumps on the line and show which are operating. The station operator has fingertip control over all equipment and by pushing a single button he starts product flowing from any one of the shipper's tanks. In a similar way, the operator starts and stops one or both of the station pumps. The Kennedy operator can, if necessary, extend his control more than a hundred miles to the Vicksburg station via teleprinter hookup. He can dial code numbers to start or stop the pump at Vicksburg and also, by dialing other numbers, can obtain an automatic report of operating conditions at that distant station.

The Vicksburg station is markedly different from Kennedy and is in charge of Chester C. Curvey, chief operator. Power comes from a 12-cylinder, 2650 hp. Nordberg V-type Supairthermal diesel engine, the largest of its type ever installed on a pipe line. The diesel drives a 2-stage United Iron Works centrifugal pump rated 3220 gpm. at 2152 ft. head through a Farrel-Birmingham 10.189:1 (500 to 5094 rpm.) high speed herringbone gear speed increaser. At a speed of better than 5000 rpm., the one pump develops as much pressure as the two identical pumps at the Kennedy station. The new Nordberg engine, the first of this V-type to go into operation, has 12 cylinders of 13-in. bore and 16½-in. stroke. It is of the 4-cycle type employing the Supairthermal system and develops its rated brake horsepower at 500 rpm. The Supairthermal engine, designed for more compact and efficient generation of power, features DeLaval high pressure turbocharging; intercooling and variable compression ratio. The Vicksburg en-

gine is presently operated up to 2000 hp. without intercooling. With intercooling its rating is increased to 2650 bhp. equivalent to 160 bmep.

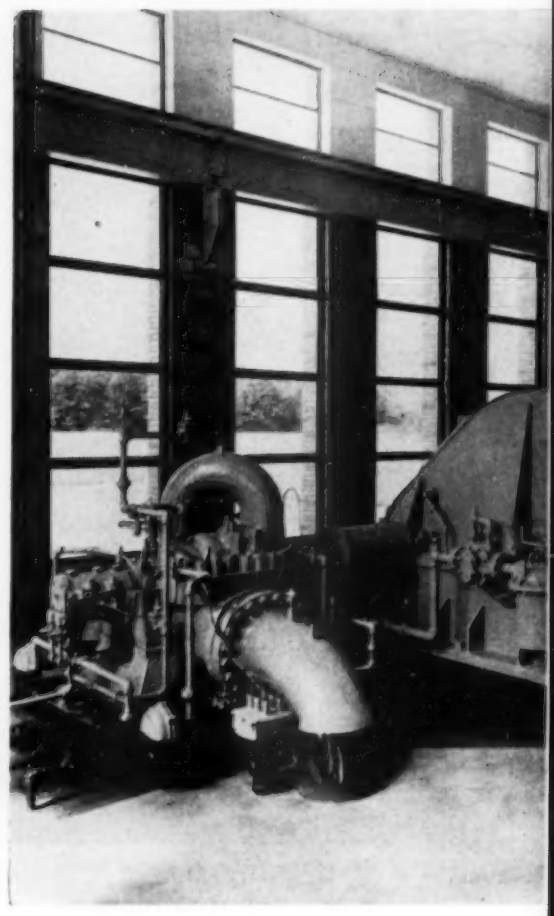
Later it is planned to install a 3:1 pressure ratio turbocharger and increase the rating to 3200 bhp. or 190 bmep.

In contrast to Kennedy, Vicksburg pumping and control facilities are housed in a single building of modern brick construction. The station is divided primarily into three operating sections; the engine pump room, auxiliary room and control room. All three rooms are attractively tiled and painted assuring clean, pleasant operating conditions. The station, in addition, has a lavatory and shower and a tool and repair room.

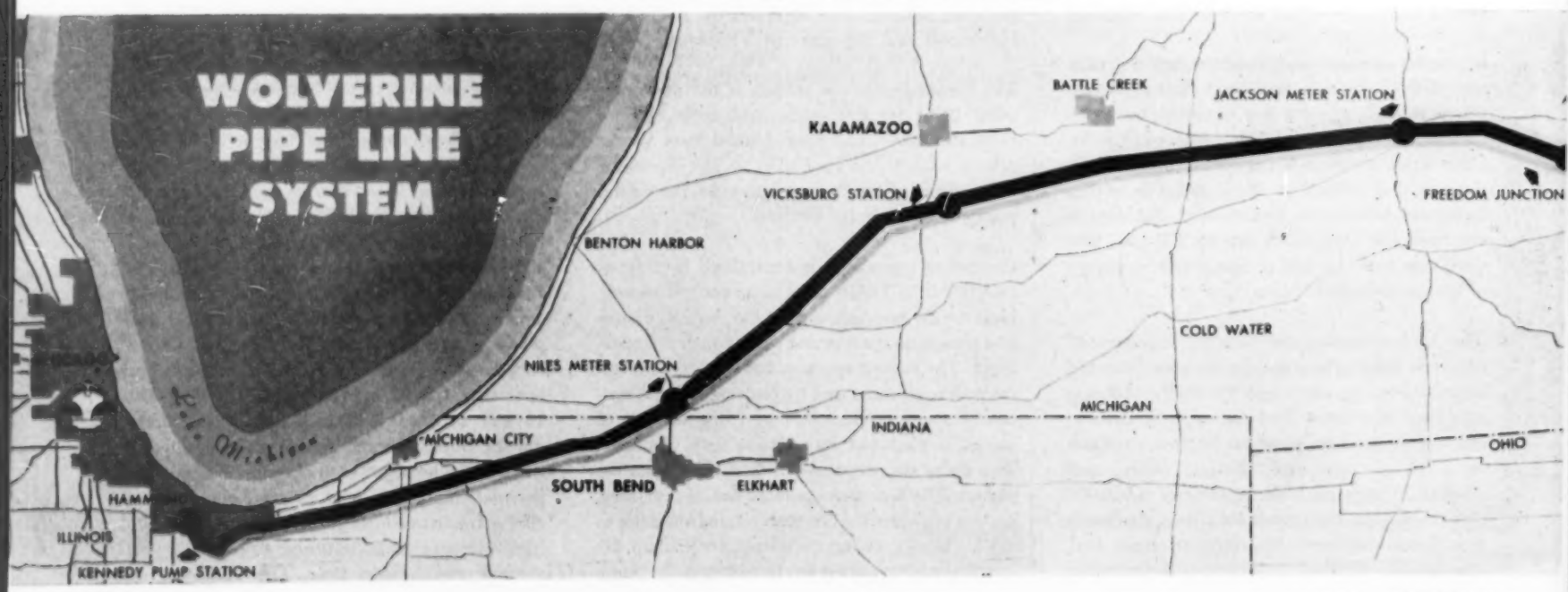
Safety was an important consideration in the layout and design of the Wolverine System and the automatic controls at the Vicksburg station are typical of the care given this feature which makes pipe lines the safest known method of transporting petroleum products. The controls are established so that any departure from regular operating pressures, temperatures, etc., both in the line and on the pumping unit (i.e., high or low lubricating oil pressure, high cooling water temperature, engine overspeed), will shut down the equipment and in certain instances, the entire station. Mercoid controls are installed where required with the central control box located in the auxiliary room. A loud alarm alerts the operator and an annunciator on the control panel indicates the cause of the trouble.

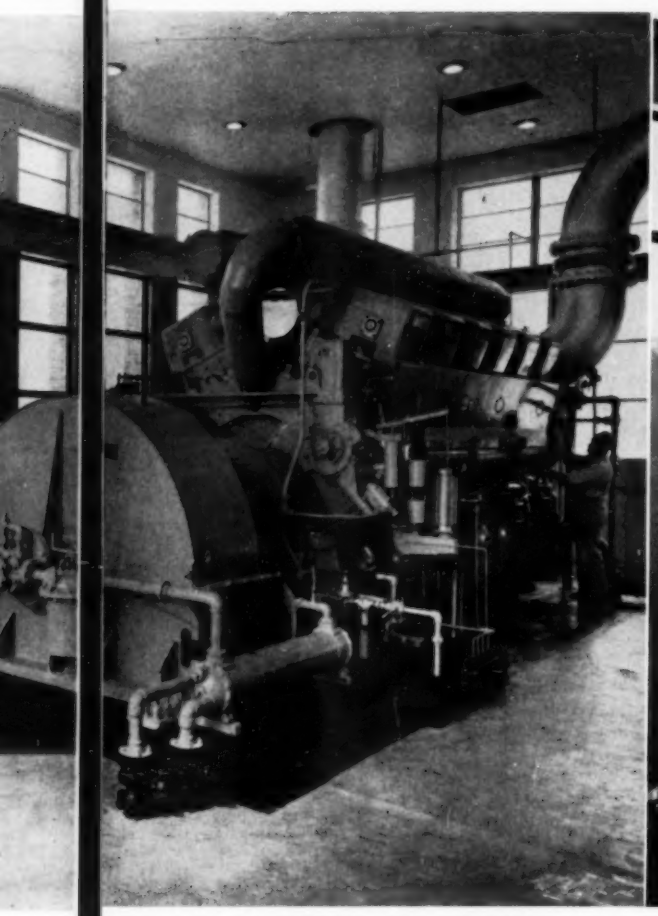
Maximum line operating pressure on the Wolverine System is established at 900 psi. gauge and over-all direction and scheduling of the movement of products originates hundreds of miles from the line. This scheduling and other routine Wolverine operations are carried on under contract by Shell's Products Pipe Line Department, which has its headquarters in Radio City, New York. There, in a remarkable dispatching room, the dispatchers direct the movement of products in a pipe line half a continent away. They maintain round-the-clock supervision of the entire line with the aid of teleprinters, carefully planned pumping schedules and an ingenious dispatching board. The key unit in following the pumping schedules is the dispatching board, a 17-ft. counter-like device. This board acts as a crystal ball, giving an up-to-the-minute picture of the line and telling the dispatchers at a glance exactly how much of what product is where at any time. A diagrammatic representation of the line, this board has markers representing the various stations and delivery points and lights show those in operation. The products in the line are represented by lengths of paper tape, scaled so that an inch represents a certain number of barrels of product and colored to identify the various products. So accurate is this system that the dispatchers are able to tell within minutes when a particular product will reach a determined point. For example, they can tell the deliveryman at a terminal to begin taking off 5000 barrels of premium gasoline at 2:35 p.m. and he will find the batch arriving on the dot.

Remote control starting of the Nordberg engine pumping units at Vicksburg is equally ingenious and requires only 90 seconds. This system for automatic starting and operation of pumping units is similar to that employed on Shell's North line from its Wood River refinery to East Chicago and is referred to as the Norris Plank system. This system utilizes the usual engine governor only to prevent overspeed with the primary control of the engine functioning through direct hydraulic cylinders which position the fuel racks in response to changes in station suction and discharge conditions. On a push button or automatic start, following the motor actuated opening of the main pump valves and the establishment of pump seal oil and engine oil circulation, the start cylinder receives air through a solenoid valve, extending its piston to open the fuel rack wide at the same moment as starting air is admitted to the engine. When the engine fires and differential pressure across the main pump increases, the solenoid valve to the idle cylinder opens, admitting air to retract the fuel rack to

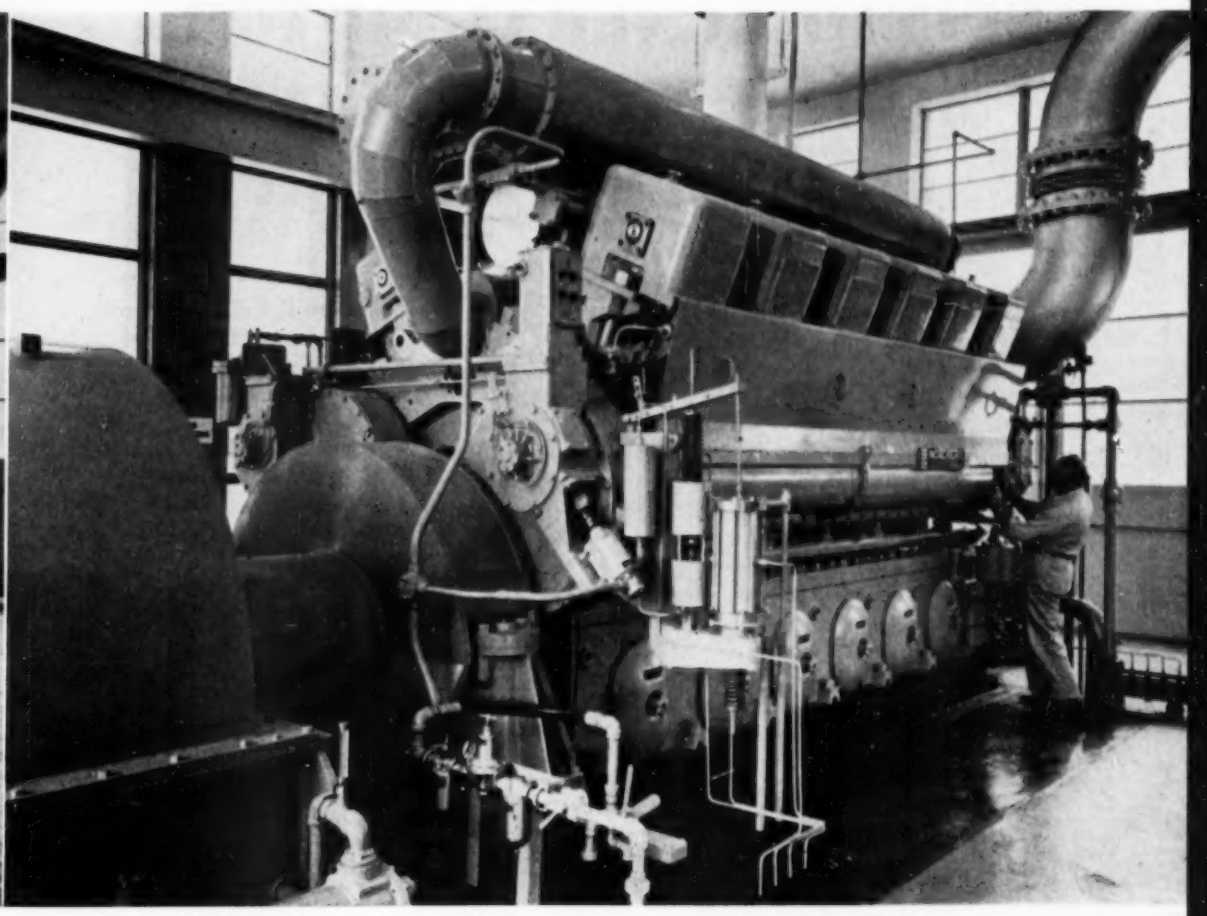


Route of the new 295-mile Wolverine 16-in. products carrier.





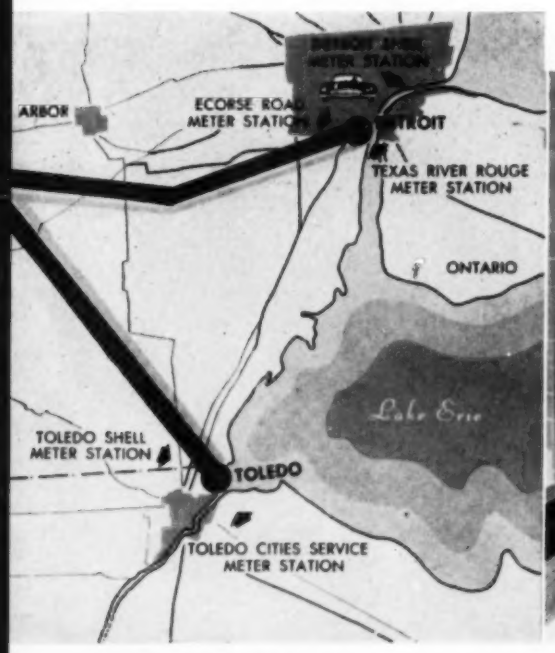
The Nordberg V-type Supairthermal engine at the Vicksburg station drives a 2-stage 3220 gpm. United centrifugal pump through a Farrel 10.189:1 speed increaser.



F. V. Miller of the Vicksburg station inspects the valve timing indicator of the 2650 hp. Nordberg Supairthermal diesel pumping engine. Scintilla fuel pumps are used.

idle position. After a delay through an electric timer, the air is released at a controlled rate by means of a time tank, allowing the engine to transition from idle to control speed over a period of approximately five minutes. This multiple sequence insures time to warm up a cold engine and the gradual application of load.

Literally no stone has been left unturned to make the Wolverine System the most modern products carrier in operation today. It is a tribute to the people of the Shell, Cities Service and Texas companies who with progressive engineering and ingenuity have established a new standard of pipe lining efficiency.



Control room of the Vicksburg station with Miller at the teleprinter and Richard T. Borchers at control panel.

List of Equipment Vicksburg Station

Pumping engine—2650 hp., 500 rpm., 4-cycle, 12-cylinder V-type, Nordberg Manufacturing Co.

Speed increaser—10.189:1, 500 to 5094 rpm., high speed, herringbone gear, Farrel-Birmingham.

Pipe line pump—Two-stage, 3220 gpm., 2125 ft. head, centrifugal, United Iron Works.

Flexible coupling—Thomas Flexible.

Governor—Woodward.

Turbocharger—DeLeval Steam Turbine.

Flexible connector—Zallea Bros.

Expansion joint—Multiflex.

Blower—American Blower.

Intake air filter—Air-Maze.

Exhaust silencer—Maxim Silencer.

Fluid cooler (radiator)—Trane.

Lube oil filter—Hilco-Hyflow.

Temperature regulating valve—Amot.

Air compressor—Gardner-Denver.

Fuel pumps—Scintilla.

Fuel oil meter—Brodie.

Before and after pump—Northern Ordnance.

Magnetic strainer—Nordberg.

Pyrometer—Alnor.

Speed indicator—Weston.

Pressure recorder—Foxboro.

EUCLID-GENERAL MOTORS 380 HP. DUAL ENGINE CRAWLER TRACTOR

A GIANT tractor and other "revolutionary" new off-the-road earthmoving equipment —developed in less than a year since General Motors Corp. acquired its Euclid division—was unveiled at the GM proving ground near Milford, Mich., Sept. 15. The event served as notice that General Motors is preparing to dominate the important equipment field in the earthmoving and roadbuilding industries through its Euclid division, which has more than doubled in size since the corporation acquired the small Cleveland concern in October, 1953.

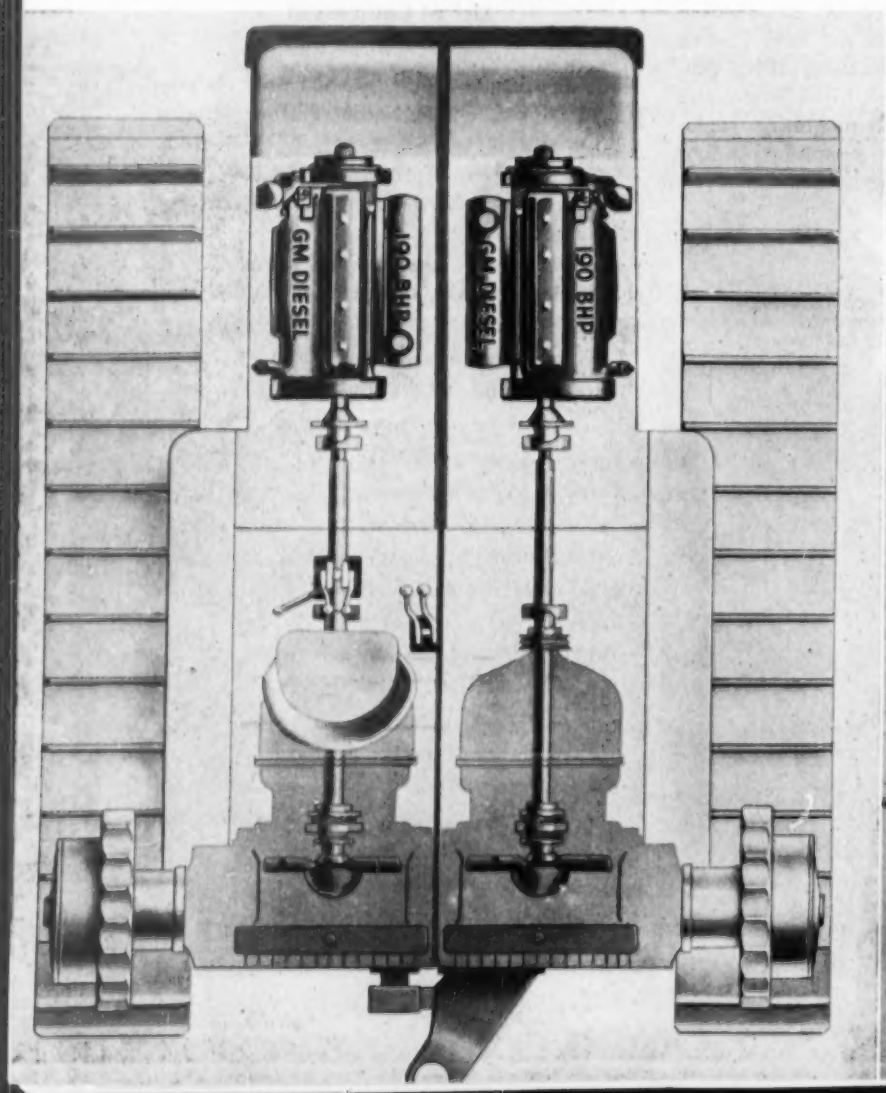
The new Euclid line was disclosed at a preview for newsmen, distributors and GM officials, following an announcement by GM President Harlow H. Curtice that the corporation's Electro-Motive division plant in Cleveland was being transferred to its Euclid division.

Principal item in the new Euclid line is a 380 hp., 53,000-lb., twin-engine diesel crawler tractor called the TC-12, the result of General Motors incentive and General Motors teamwork. The TC-12 was developed jointly in recent months through the Euclid, Allison and Diesel Engine divisions. Two GM 6-71 diesel engines of 190 hp. each give the tractor more than twice the horsepower of any tractor now in production, it is claimed. They are connected to Allison torque converters and Torqmatic transmissions.

Euclid's entry into the crawler tractor market was announced by R. Q. Armington, Euclid general manager. Distributors from 20 nations and a host of technical writers and newsmen watched as the experimental tractor went through its paces. Mr. Armington told the preview audience that crawler tractors and their attachments have a yearly sales of $400 million, accounting for more than half of the total annual earthmoving equipment market.

Along with its twin-engine crawler, Euclid also

Allison employe is shown with Allison CRT-5530 transmission (left) used in Euclid TC-12 crawler tractor and Buick Dynaflow transmission (right) to provide comparison of size. No clutch is needed to shift gears with Allison CRT-5530.



Diagrammatic sketch shows arrangement of principal components and the simple controls in new Euclid TC-12 tractor. Power from each engine is transmitted to a separate track through Allison Torqmatic transmissions with three speeds forward, three in reverse.

TC-12 operator demonstrated push-loading ability of powerful new twin-engine, 380 hp. Euclid crawler tractor during preview demonstration at GM proving ground.

introduced three new experimental rubber-tired scrapers—the S-7, S-18 and TS-18—during the preview showing.

Each drive train of the TC-12 independently powers one track. Final drive gearing is the same job-proven Euclid planetary used in off-highway 50-ton dump trucks and the 25-yd. bottom-dump wagon. Two separate drive and track assemblies are free to oscillate on a 7-in. transverse shaft.

The crawler can be separated for shipment where weight and width restrictions are encountered. The 2-section design also gives flexibility over uneven ground.

The tracks maintain good traction because each half of the tractor maintains better ground contact in rough terrain. A free movement of seven inches is limited by stops welded to each frame half. For applications where oscillation is not desirable, some of the tractors will be field tested with rigid mounting on the cross shaft. The TC-12 is designed to provide higher power-to-weight ratios. Drawbar pull, equal to or better than current production crawlers, but at higher ground speeds, will give tractor ability for faster pusher loading of rubber-tired scrapers, according to Mr. Armington, who said tests indicate that the TC-12 develops approximately twice the drawbar pull at 2½ mph. scraper loading speeds, compared to present big tractors. He said this loading speed matches the first gear speed of rubber-tired scrapers for better loading.

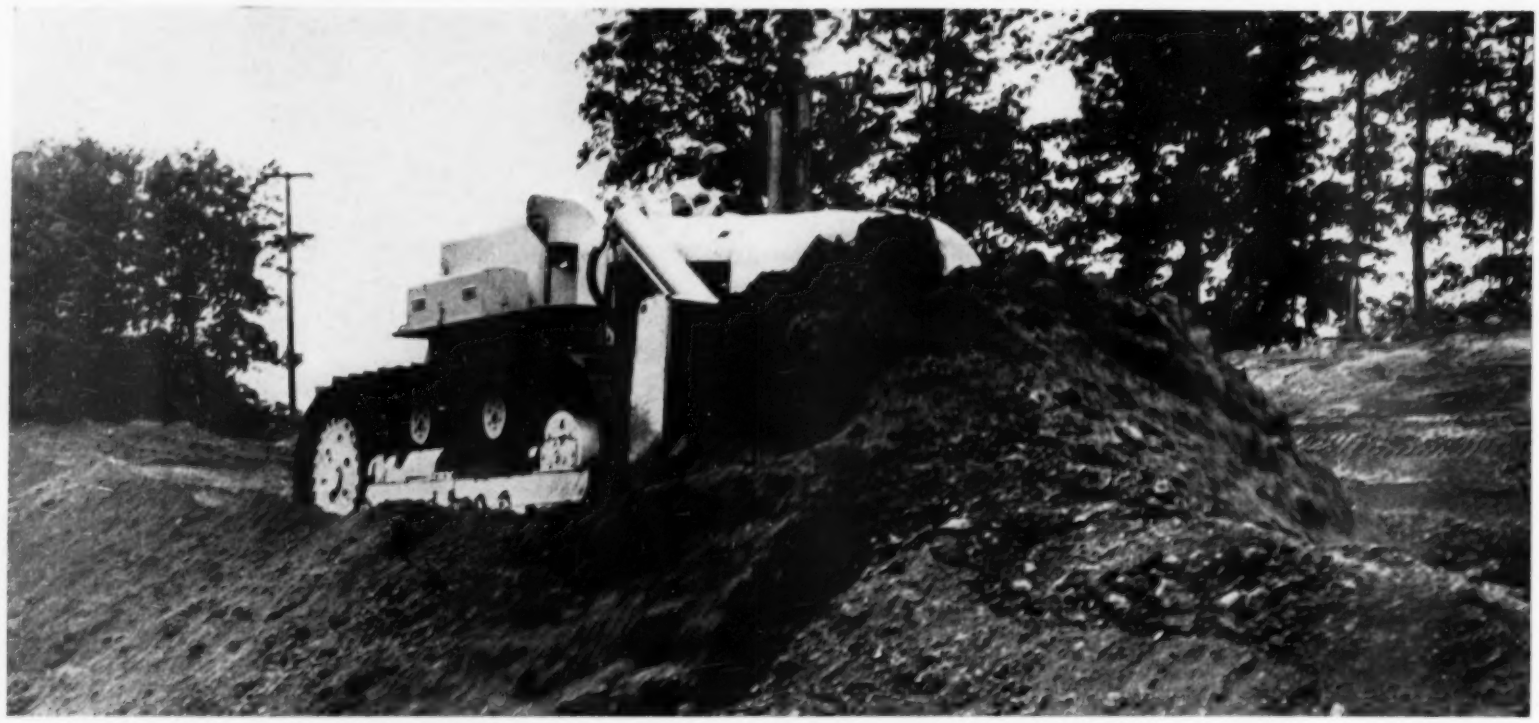
The TC-12 has two transmissions, each with an integrally mounted torque converter. Each transmission, made by the Allison division, provides three speed ranges forward and three in reverse. All shifting is accomplished under full power. There is no master clutch. The tractor can be shifted from one speed range to the other without loss of motion and can be shifted into reverse while still moving forward. Top speed is 8 mph. The Twin Power arrangement permits a fast, flexible steering system. The TC-12 can be steered in several ways: by increasing or decreasing the speed of one engine for gradual, even change; by putting one transmission in neutral and applying a track brake; or by putting one transmission in forward and the other in reverse for rapid, sharp turns under full power.

The tractor features accessibility for all components. It can be dismantled and reassembled with ordinary servicemen's tools. The engines are mounted side by side and drive through universal joints and drive shafts to the torque converter, located below and to the rear of the operator location. The converter, transmission, reduction gearing and steering brake form one complete removable assembly. The reduction drive gears for each half of the tractor transmit power through an axle shaft to the sun pinion and the 3-gear set of the Euclid planetary.

The front hood cover of each tractor half is hinge-mounted to permit ready access to the engine. Two radiators are located to the rear in order to make the operator's position free of dust and heat. The radiators are hinged to rotate out of the way for access to the transmissions. Two SAE standard mountings are located at the rear of each tractor half for mounting of winch and cable control units.

Aimed at an expanding tractor market which has increased 67% in the last five years, the Euclid TC-12 will find application in what has been called the greatest era of road building the U. S. has undertaken, as well as in open pit mining, logging and other industries.

The Allison Torqmatic drive in the TC-12 was designed specifically for this crawler tractor. It is identified as the CRT-5530, combining both torque converter and transmission in a single package. The CRT-5530 consists of a multi-phase, single-stage converter plus a forward and reverse constant mesh compound planetary gear unit operating in combination with a 3-speed planetary type main transmission gear train. The throttle control levers are placed close together so the operator can move them either together or separately with one hand. However, for gear range selection one control lever is used for both



Euclid division's TC-12 was put through its paces during bulldozing demonstration. The tractor's 2-section design gives it flexibility over uneven ground.

transmissions, thus interlocking low, intermediate and high gear operation for each track.

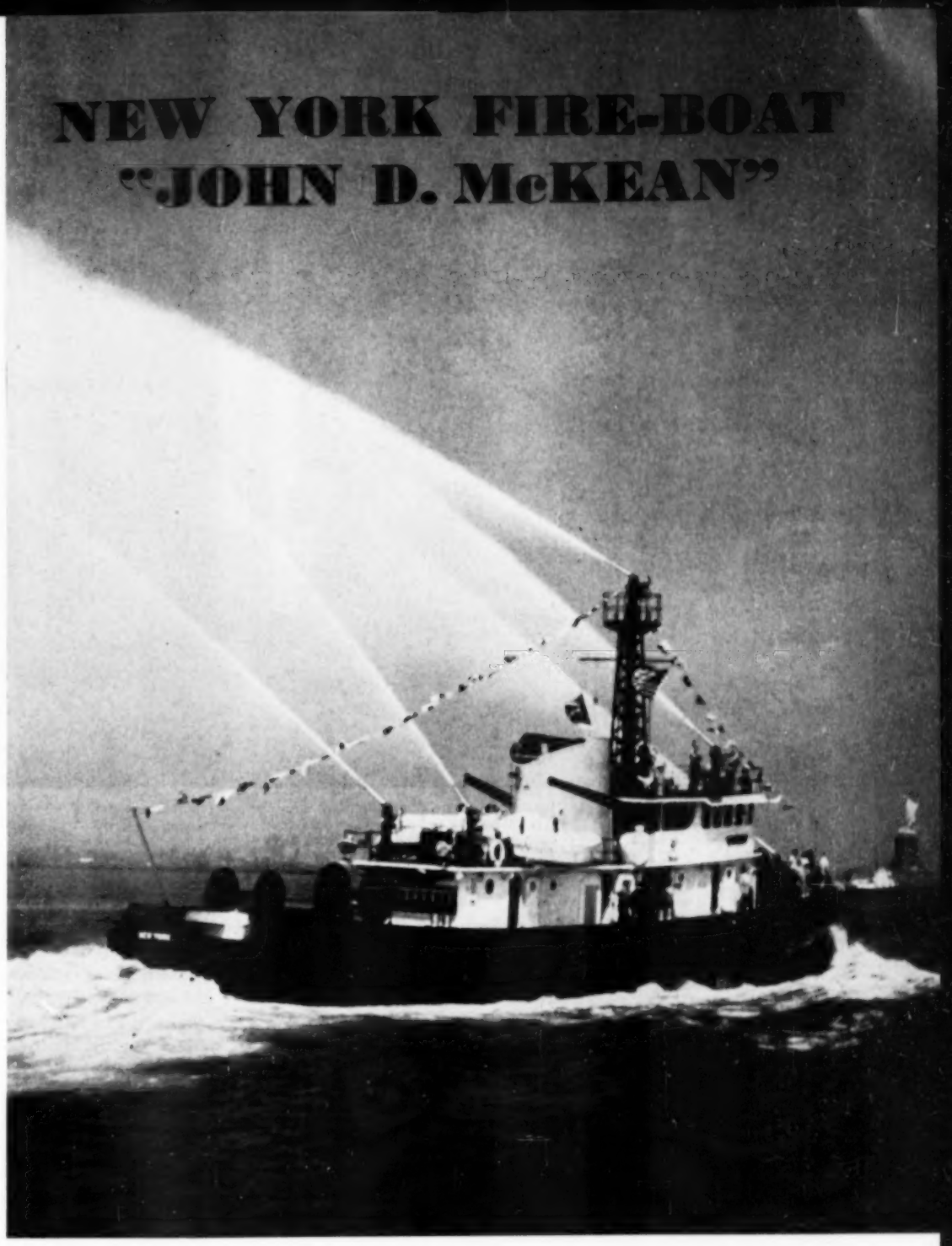
In the CRT-5530 transmission, oil pressure is employed to maintain charging pressure in the torque converter, operate the multiple plate clutches in the transmission, lubricate the moving parts and circulate oil through the cooler. This oil pressure is produced and maintained under all operating conditions by input and output pressure pumps. The former operates whenever the engine is running and the latter operates only when the tractor is in motion.

The three new scrapers introduced for the first time at Milford will be manufactured in limited quantities in 1954. Euclid's entry into the small scraper field is the model S-7 scraper, a 7 cu. yd. struck capacity, overhung engine unit. It is powered by a 138 hp. GM diesel engine. Full 90-degree hydraulic steering enables this unit to make non-stop turns in 26 ft. Other features are its 5-speed transmission, three independently operated hydraulic scraper controls and a 4-section, interchangeable, reversible cutting edge. Planetary gears are at the outside of the drive wheels and all intermediate drive components are also readily accessible.

The S-18, the second new scraper previewed, is an 18 cu. yd. overhung machine using a 300 hp. GM engine series 6-110 in conjunction with an Allison Torqmatic converter and transmission. This power train eliminates clutching and allows the operator to shift under full power at all times. A no-spin differential automatically directs the full torque to the drive wheel having the best traction. The giant TC-12 crawler provides the necessary horsepower for effectively pushloading large capacity scrapers, and with the S-18 it will provide a big-production, high-speed earthmoving combination, GM claims. As another improvement in Twin Power development, Euclid also unveiled a third scraper, the experimental TS-18 with overhung engine. The TS-18 features two 190 hp. GM diesel engines, one in the tractor and the other located behind the scraper bowl driving the rear wheels. These engines drive through Allison Torqmatic converters and transmissions which supply a smooth flow of power to the four drive wheels. In addition to the 4-wheel drive principle, added traction is gained through no-spin differentials in both the scraper and tractor drive axles. The bowl is 18 cu. yd. struck measure. All three scraper operations of the bowl lift, apron and ejector are hydraulically controlled independently of each other. Full 90-degree steer allows this scraper to make 180-degree turns in 35 ft.

Euclid division's entry into the small scraper field is its model S-7 scraper, introduced during a General Motors preview showing of road-building and earthmoving equipment. The S-7 is a 7 cu. yd. struck capacity, overhung engine unit powered by a 138 hp. GM diesel engine.

NEW YORK FIRE-BOAT "JOHN D. McKEAN"



The M/V "John D. McKean," New York City's new $1,427,000 fireboat, approaches the Statue of Liberty in New York harbor. She is powered by two 8-cylinder Brown-Boveri turbo-charged Enterprise propulsion diesels with Young after coolers.

THE *John D. McKean,* New York City's newest fireboat, was delivered recently to the city fire department at special ceremonies held in New York harbor. Capable of pushing or towing a stricken vessel while spraying her decks at the same time with 14,000 gallons of water per minute, the new $1,426,000 fireboat is powered with two 1000 bhp. Enterprise diesel engines manufactured in San Francisco. Two additional Enterprise diesels of the same horsepower drive her four high-capacity fire pumps.

The *John D. McKean* replaces the obsolete *William L. Strong* and is the first addition to the city's 9-vessel fire-fighting fleet in 16 years. She was built to Class A1 of the American Bureau of Shipping at the John H. Mathis shipyard in Camden, N. J., and, after a highly successful series of dock and sea trials at her builder's yard, was accepted in New York by New York City Fire Commissioner Edward F. Cavanagh, Jr. She was designed by John H. Wells, naval architects, and was constructed under the supervision of Public Works Commissioner Frederick H. Zurmuhlen, P.E., R.A. Although she will not be certificated by the U. S. Coast Guard, all applicable requirements have been incorporated in her design. The *John D. McKean* measures 128 ft. 9 in. in over-all length, has a beam (molded) of 30 ft., a depth amidships (molded) of 14 ft. 3 in. and a maximum draft of 9 ft. 3 in. Her two 1000 bhp. main propulsion engines give her an estimated speed of 16 mph.

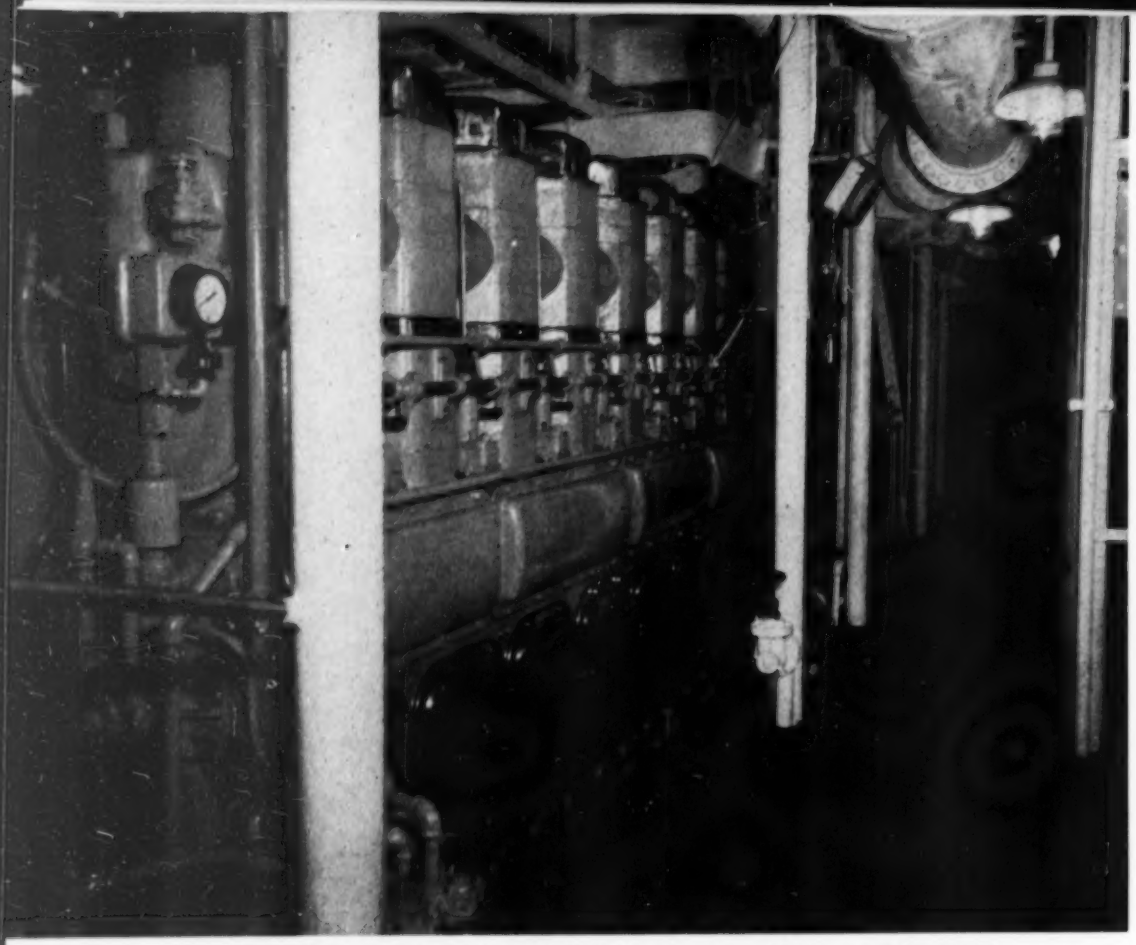
The *John D. McKean* is an emergency vessel and as such must be ready to go into immediate operation at a moment's notice. This means that her main propulsion and pumping engines may be called upon at almost any time to carry a full load without a warm-up period. To prevent damage to the engines under these conditions electrical heaters are immersed in the lube oil and jacket water and warm lube oil and jacket water are circulated through the units at all times while the vessel is in port. Both the main propulsion and pumping engines are installed in the vessel's engine room. The main propulsion units are model DMG-38, 8-cylinder, 12 in. by 15 in., 4-cycle, air-starting, turbocharged Enterprise diesel engines, rated at 1000 bhp. each at 425 rpm. Of the direct-reversing type, they are direct-connected to two 3-bladed, 63 in. by 62 in. manganese bronze propellers.

The two pumping engines are of the same general type as the main propulsion units, the chief difference being their engine speeds and number of cylinders. Each is an Enterprise model DSG-316, 6-cylinder, 12 in. by 15 in. 4-cycle, air-starting, turbocharged diesel engine, rated at 1000 bhp. at 600 rpm. The main propulsion and pumping engines are both of the solid-injection type and both are capable of a 25% overload for a period of at least one hour. The *John D. McKean* has a fuel oil capacity of 7600 gallons, sufficient to operate the main propulsion engines at one-quarter load and the pumping engines at three-quarters load for approximately three days. Although forming an integral part of the hull at top and bottom, the fuel oil storage tanks located fore and aft are so designed that their sides are separate from the hull, thus protecting them from possible damage. Fuel oil is brought from the storage tanks to two 200-gallon day tanks by a built-in transfer pump on each engine, passing through a duplex filter on the suction side of each pump. From the day tanks it is picked up by individual built-in booster pumps and sent to the injection pumps and nozzles at each cylinder through another set of duplex filters.

In port, a 20 gpm., motor-driven transfer pump, with a rated head of 25 psi. and driven by a 1½ hp., 1750 rpm. electric motor, can be used to bring fuel from the storage tanks to the day tanks as needed. In the event of an emergency, should one or more of the built-in booster pumps fail while the vessel is under way, two standby pumps have been installed to feed fuel from the day tanks to each of the four engines. Lube oil is stored in two 300-gallon storage tanks, reaching the four 150-gallon service tanks by gravity. It is picked up from the service tanks by a built-in lube oil pump on each engine and passed first through a shell-and-tube type lube oil cooler and duplex, full-flow strainer before reaching the cylinders, pistons and bearings under pressure.

As the lube oil drains into each engine's sump it is picked up by a second built-in pump and sent back to the service tanks through individual continuous-flow clarifiers. Both the lube oil coolers and the clarifiers are equipped with hand-operated by-pass valves.

Fresh water is used as a coolant in the four lube



Looking forward in the "John D. McKean's" engine room with the port main propulsion Enterprise engine at the left. Rated 1000 hp. at 425 rpm., it is an 8-cylinder, 4-cycle, direct-reversing, direct-connected, solid-injection, turbocharged unit with a bore of 12 in. and a stroke of 15 in.

oil coolers. It is circulated through each engine's closed jacket water system by a built-in circulating pump, passing from the engine to a heat exchanger and then through the lube oil cooler before re-entering the engine. Amot thermostatically controlled by-pass valves are installed on all four heat exchangers, keeping the jacket water temperature at a prescribed level and making it unnecessary to install similar valves on the fresh-water-cooled lube oil coolers. As it leaves each engine, the jacket water passes through an electrolytic descaler, which keeps the water free of scale formation at all times. Makeup water for each closed system is drawn from the vessel's 300 gallon fresh water tank. Electric heating coils are used to heat the jacket water as well as the lube oil while the vessel is in port. Four turbine-type pumps, rated 10 gpm. at 40 psi. and driven by 1 hp., 1750 rpm. motors, circulate the warm water through the engine jackets. Four-inch Amot thermostats are used to control the engine jacket water temperature.

Raw sea water is circulated as a coolant through all heat exchangers and through the engine-air intercoolers installed on each unit by built-in salt water pumps. It is drawn from an individual sea chest serving each system and is discharged overboard after completing its circuit. If desired, one of the vessel's two 200 gpm. general service pumps can be used to circulate raw water through the speed increasers installed between the pumping engines and the four fire pumps.

Engine air for the 4-cycle main propulsion and pumping engines is drawn through oil-bath type filters and snubbers. Water-cooled intercoolers have been installed between the turbochargers and the air manifolds. Starting and reversing air at a pressure of 250 lbs. is supplied by a 2-stage 4½ in. by 2½ in. by 3½ in., air-cooled compressor. This compressor is driven through V-belts by a 7.5 hp., 220-volt, 3-phase, 60-cycle electric motor and can fully charge the four starting air tanks in approximately one hour. It also supplies engine room service compressed air and is equipped with an air-intake filter and self-contained pressure lubricating system. A duplicate compressor is provided as a standby unit.

A third air compressor, driven by a 60 hp., 1200 rpm. Buda diesel engine and capable of delivering 230 cfm. of free air at 125 psi., supplies compressed air for the vessel's pneumatic tools. It is a 2-stage unit, having four low-pressure cylinders and two high-pressure cylinders.

The main propulsion engines will generally be operated directly from the pilot house, with Enterprise single lever hydraulic controls, permitting immediate maneuverability with no lag time. All four Enterprise engines are equipped with hydraulic governors as well as overspeed governors. Exhaust gases from the four Enterprise engines are expelled through vertical snubbers installed in the fidley and enclosed in a streamlined stack. Each of the engines is served by an individual gauge panel, equipped with an exhaust pyrometer, tachometer and with gauges on lube oil pressure and temperature, jacket water pressure and temperature, raw water pressure, engine air pressure and fuel oil pressure. Alarms are provided on high jacket water temperature and low lube oil pressure.

The fact that the *John D. McKean's* pumping engines are distinct from her main propulsion engines ranks her, perhaps, as one of the most versatile fireboats in the world. Most fireboats depend upon their main propulsion engines for pumping power, with the result that, at the scene of a fire, their propeller shafts are left with scarcely enough power to make headway. In fact, there is often danger that their propeller shafts will not be able to overcome the backward thrust of the high-pressure jet streams leaving

Edward F. Cavanagh, Jr., commissioner of New York's fire department (center), accepts delivery of the new fireboat "John D. McKean" from Frederick H. Zurmuhlen (left), commissioner of the city's public works department, which supervised construction of the new vessel, and William Robinson (right), president of John H. Mathis Co., the builders. Looking on at the right are the following survivors of the fireman after whom the vessel has been named: his son, John D. McKean, Jr., 15; his widow, Mrs. John D. McKean; and his daughter, Marilyn, 12.

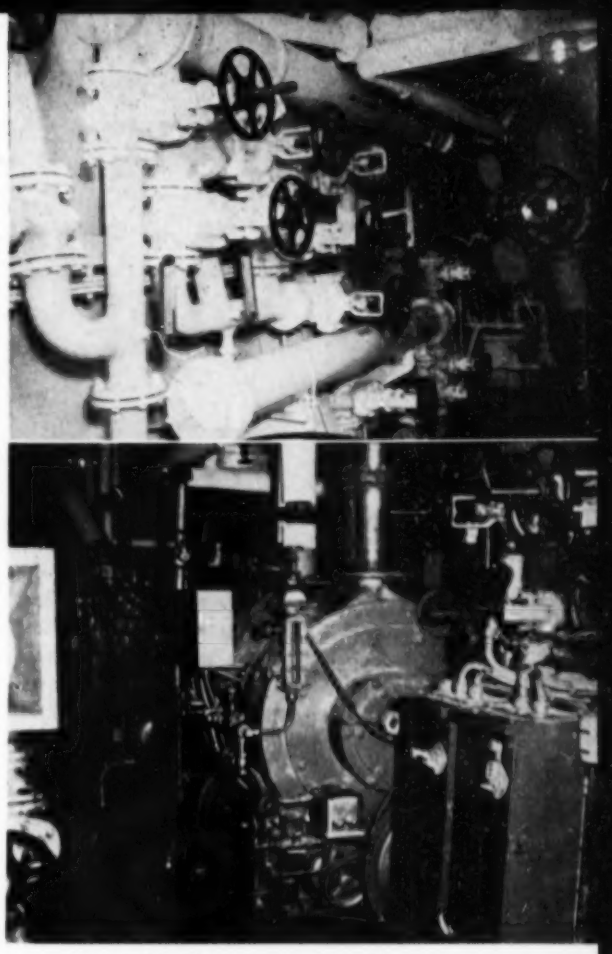
the monitor nozzles. This condition has seriously limited the maneuverability of fireboats in the past and has made it impossible for them to push or tow a burning vessel while pumping at full capacity. It was for these reasons that the *John D. McKean* was designed as she was. With her separate main propulsion and pumping engines she can spray the decks of a burning ship with 14,000 gallons of water per minute, while at the same time pushing or towing her away from a pier or away from other vessels in the area.

In designing the *McKean's* intricate hydraulic system, the naval architectural firm of John H. Wells received valuable assistance from John L. Holian, deputy-chief-in-charge of the New York City Fire Department's Marine Division. Also installed in the *McKean's* engine room are two 40 kva. diesel-generator sets, supplying alternating current for the auxiliaries and for ship's service. The self-excited generators deliver 3-phase, 60-cycle power at 240 volts and are driven at 1200 rpm. by a pair of 60 hp., 4-cycle, 6-cylinder, 4½ in. by 5½ in. Buda diesel engines. This power is reduced to 120 volts where needed by three 15 kva., single-phase, 60-cycle transformers and is distributed by a deadfront type switchboard, equipped with synchroscope and air circuit breakers. A 25 hp. heating boiler is also installed in the engine room. Having a capacity of 3500 sq. ft. E.D.R. and a working pressure of 30 psi., it burns diesel oil and is equipped with a condensate pump which discharges against a pressure of 45 psi. The *McKean's* fresh water pressure system consists of a 100-gallon galvanized steel storage tank and a 10 gpm. self-priming turbine pump driven by a 1½ hp., 1750 rpm. motor. The pump has a working pressure of 55 psi. and a test pressure of 100 psi.

In addition to the main fire pumps, the *McKean* is equipped with the most modern type of fire-fighting equipment, including foam generators, a CO_2 system, and paving breaking equipment for use in fighting under-pier fires. For the comfort and safety of the crew, a complete mechanical ventilation system has been installed throughout the vessel. This system is so designed that oxygen can be introduced into the crew's quarters and engine room ventilating systems during a fire, particularly when the smoke conditions in these spaces are excessively bad.

The *McKean's* wide-view pilot house is equipped with special heat-treated glass windows and with Enterprise single lever hydraulic controls for the main propulsion engines. In addition to a Hydrapilot steering console, it features among its navigation aids a radar set, a 2-way radio-telephone, rudder angle indicator, an inter-ship public address system, sound-powered telephones, binnacle, engineroom telegraph and pump pressure telegraph. Atop the pilothouse are a cast bronze air whistle and a 19 in. aluminum searchlight.

The *John D. McKean* is the result of long, careful planning and of the closest possible cooperation between builder, designer and city officials. Among those closely connected with her design and construction are: F. J. Richartz and Paul Krueger, of the John H. Mathis Co.; S. W. Steffensen and Harold Wetterholm, of the New York City Department of Public Works; and Hunter Hickman and John F. Eaton of Wells.



Top: Serving the port pumping engine are Ross heat exchanger and lube oil cooler, both of which are equipped with Amot automatic temperature control valves.

Bottom: A front end view of the Cyclotherm heating boiler aboard the "John D. McKean."

List of Equipment

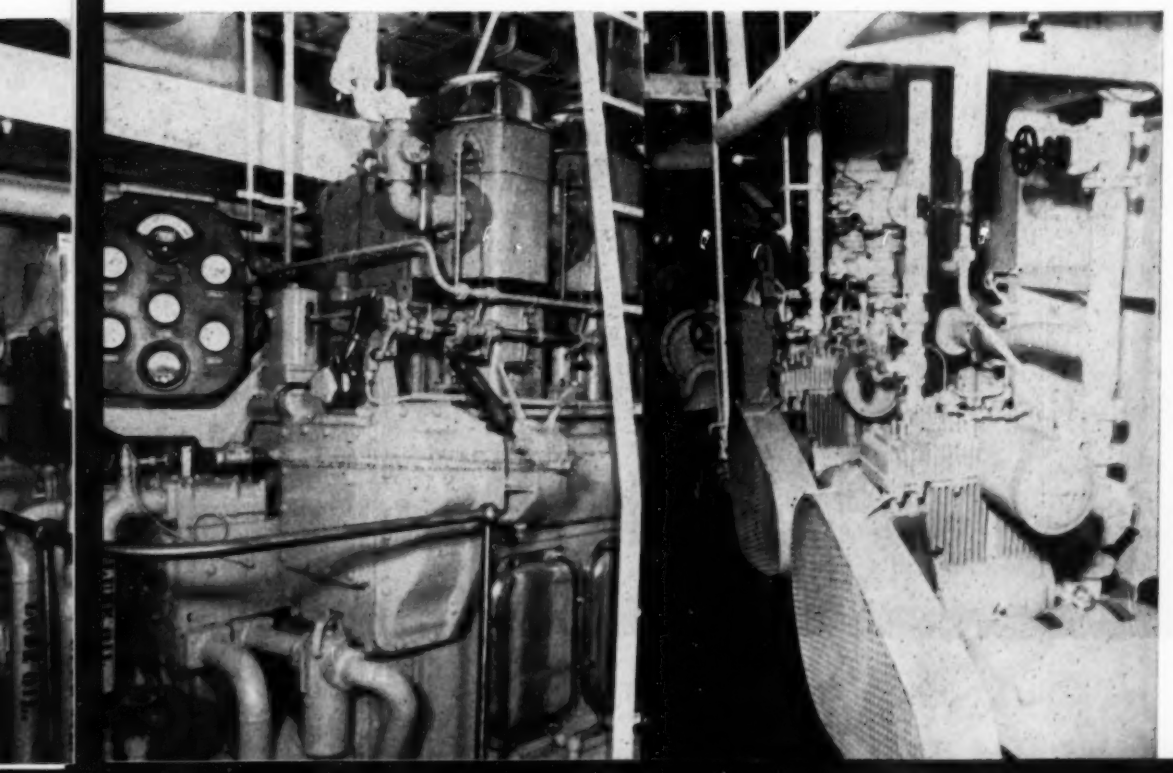
Main propulsion engines—2 model DMG-38, 8-cylinder, 12 in. by 15 in., 4-cycle, turbocharged, 1000 hp., 425 rpm., diesel engines, Enterprise.

Pumping engines—2 model DSG-316, 6-cylinder, 12 in. by 15 in., 4-cycle, turbocharged, 1000 hp., 600 rpm., diesel engines, Enterprise.

Governors—Woodward.
Turbochargers—Brown-Boveri.
After coolers—Young Radiator.
Main fire pumps—Worthington.
Steelflex couplings—Falk.
Duplex fuel oil strainers—Purolator.
Auxiliary lube oil circulating pumps—Worthington.
Auxiliary lube standby and transfer pumps—Worthington.
Lube oil filters—Winslow.
Fuel oil filters—Nugent.
Lube oil coolers—Kewanee-Ross.
Jacket water heat exchangers—Kewance-Ross.
Thermostatic by-pass valves—Amot.
Auxiliary jacket water circulating pumps—Worthington.
Engine-air filters—Burgess-Manning.
General service pumps—Worthington.
Engine alarm panels—Century.
Gauges—Marsh.
Pyrometers—Alnor.
Tachometers—Weston.
Exhaust snubbers—Burgess-Manning.
Diesel-generator sets—Buda.
Transformers—Westinghouse.
Motor-driven air compressors—Quincy.
Diesel-driven air compressor—Worthington—Buda.
Heating boiler—Cyclotherm.
Batteries—Exide.
Builder—John H. Mathis Co.
Naval architect—John H. Wells, Inc.

One of the "McKean's" two Enterprise pumping engines, each of which is rated at 1000 hp. at 600 rpm. The gauge panel is mounted directly on the engine frame and is equipped with a Weston tachometer, Alnor pyrometer and Marsh gauges.

The two motor-driven Quincy compressors which supply starting air at a pressure of 250 lbs. for the four Enterprise diesels. They are 4½-in. by 2½-in. by 3½-in. units and are driven by 7.5 hp. Century motors. One unit is a standby.



THE ALL-PURPOSE MECHANICAL REEFER

By M. O. WAUGH

AS recently as 1949, a railroad car equipped with mechanical refrigeration had to be a custom-made job! Today, Fruit Growers Express Co., which has pioneered with experiments in modern mechanical car refrigeration, is turning out four such cars a day in its shops in Alexandria, Va. As of last June, with its associates, the Western Fruit Express Co. and the Burlington Refrigerator Express Co., FGE had 330 mechanical refrigerator cars in service.

One hundred and seventeen more cars were rolling off the assembly line and slated for service in August. One hundred and sixty additional cars are authorized for construction during the first quarter of 1955, with a total authorization of investment for cars on order and in service of some $13,000,000.

The growing needs of the citrus juice concentrates industry, especially, indicated by 1948 that intensive experimenting was in order. Fruit Growers Express Co. set to work in nine different possible types of mechanical refrigeration, to find out which would be best for the specific needs of the fresh and frozen food shippers. Then, as now, a diesel-electric system developed in cooperation with the Frigidaire Division of General Motors Corp. seemed to win out in tests and experiments. The first of the FGE mechanical refrigeration cars were to be used for transporting frozen foods and were built to maintain zero degree temperature within the cars. The new cars, however, have been designed to carry either fresh or frozen loadings. Temperature is set by thermostat and either heat or refrigeration can be maintained at a given degree regardless of outside heat or cold—from zero to a high of 70°F.

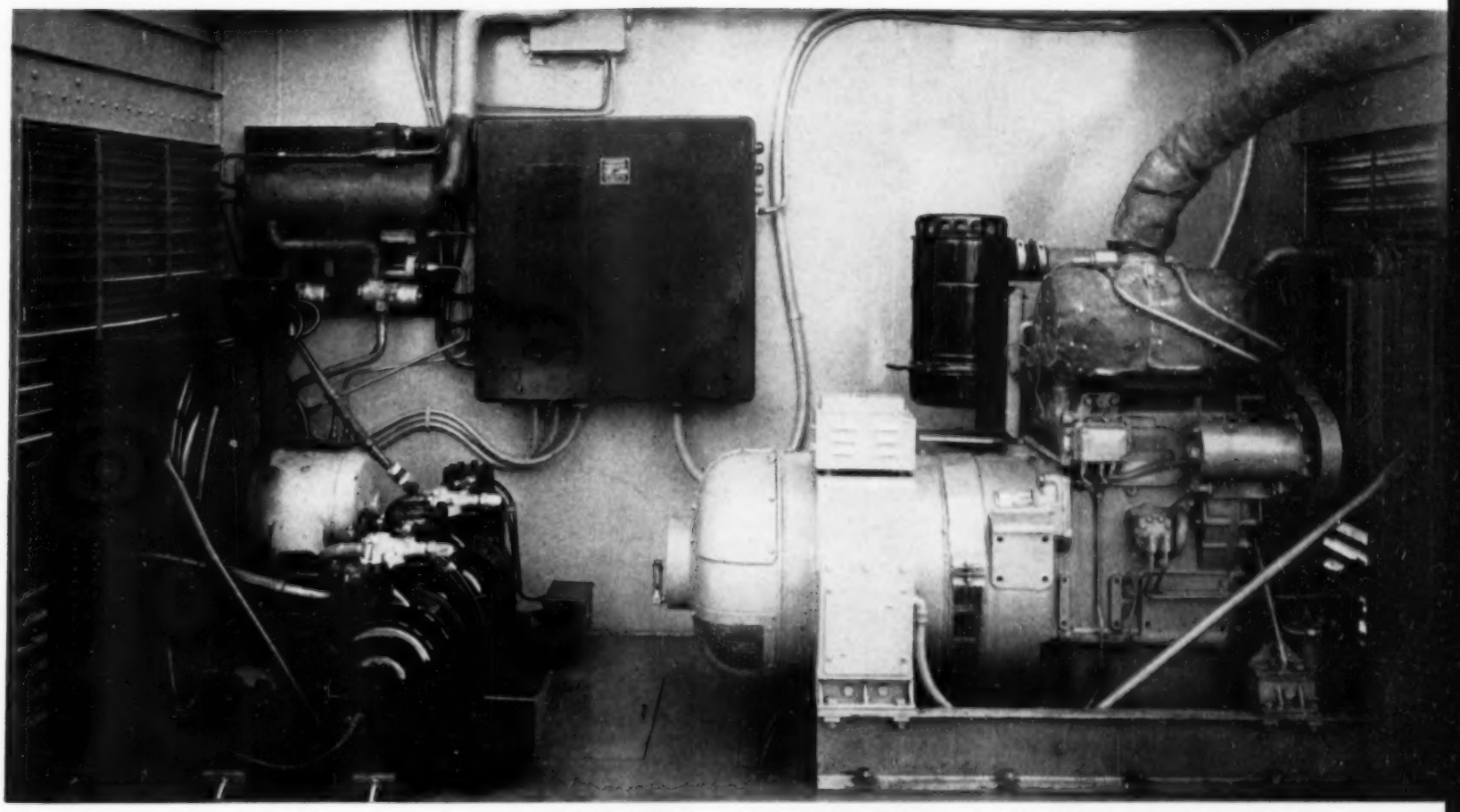
The new cars coming off the assembly line at the Alexandria shops are provided with the latest improvements in refrigerator car design and equipment: 6-ft.-wide sliding doors, roller-type bearings, rolled steel wheels, rubber draft gear and cushioned trucks with long spring travel. There is an A.A.R. welded steel underframe. The car body is a riveted Z-bar superstructure with steel sides, ends and rigid riveted metal roof. Insulation is 6 in. for floor and walls and 9 in. for the roof. The cars have an average load limit of 128,500 lbs. Loading space is 8 ft., 8 in. by 44 ft., 5½ in. and 7 ft., 10½ in. high; cubic footage is 3034.

B. E. Duff, superintendent of mechanical refrigeration for these associated express companies, calls attention to the carefully worked out details which are making such mechanical refrigerator cars successful in operation. "In these all-purpose cars," he says, "the diesel-alternator unit, condensing unit and control panel are located in a compartment at one end of the car, separated from the loading space by an insulated wall. There are louvered openings in the compartment's side walls for air circulation. Two inter-connected fuel tanks with a capacity of 200 gallons each, for the diesel engine, are located underneath the car and can be filled from either side. There's a visible fuel gauge to show the amount of fuel in the tanks; a 12-volt battery, for starting the engine, is mounted under the compartment floor. In this compartment also are the thermostat, motor starter relays and fuses, in a refrigerator control cabinet to be ready to hand."

The engine is a Detroit Diesel 2-71, 2-cylinder, 2-cycle, 34 hp., 1200 rpm., which has an average fuel consumption of approximately one gallon per hour. This is coupled to a 20 kw. self-excited alternator to give the 220-volt, 3-phase, 60-cycle current needed to operate the refrigeration system. The engine is protected with a mechanical type shut-down device which automatically stops it if the engine should develop a lack of lube oil, high coolant temperatures or over speed. In operation the diesel-alternator unit runs continuously, with the refrigeration or heating equipment functioning to the thermostat's requirements.

Within the insulated portion of the mechanical refrigeration car body, but separated from the loading space by the bulkhead facing, is hung a finned evaporator coil. Inspection is through a removable panel opening on the loading side.

One of the 50 modern 50-ft., 70-ton, Frigidaire-equipped all-purpose mechanical reefer cars constructed by Fruit Growers Express Co. at Alexandria, Va. The engine is a Detroit Diesel 2-71 engine.



A view taken from outside of "A" end of car with steel end sheets removed. Shown are the GM 2-71, 2-cylinder, 2-cycle diesel with Delco alternator at right; the compressor and condensing unit at left; the refrigeration control panel on bulkhead at left, and the electrical control panel at center. The blower motor (not shown) is at upper right.

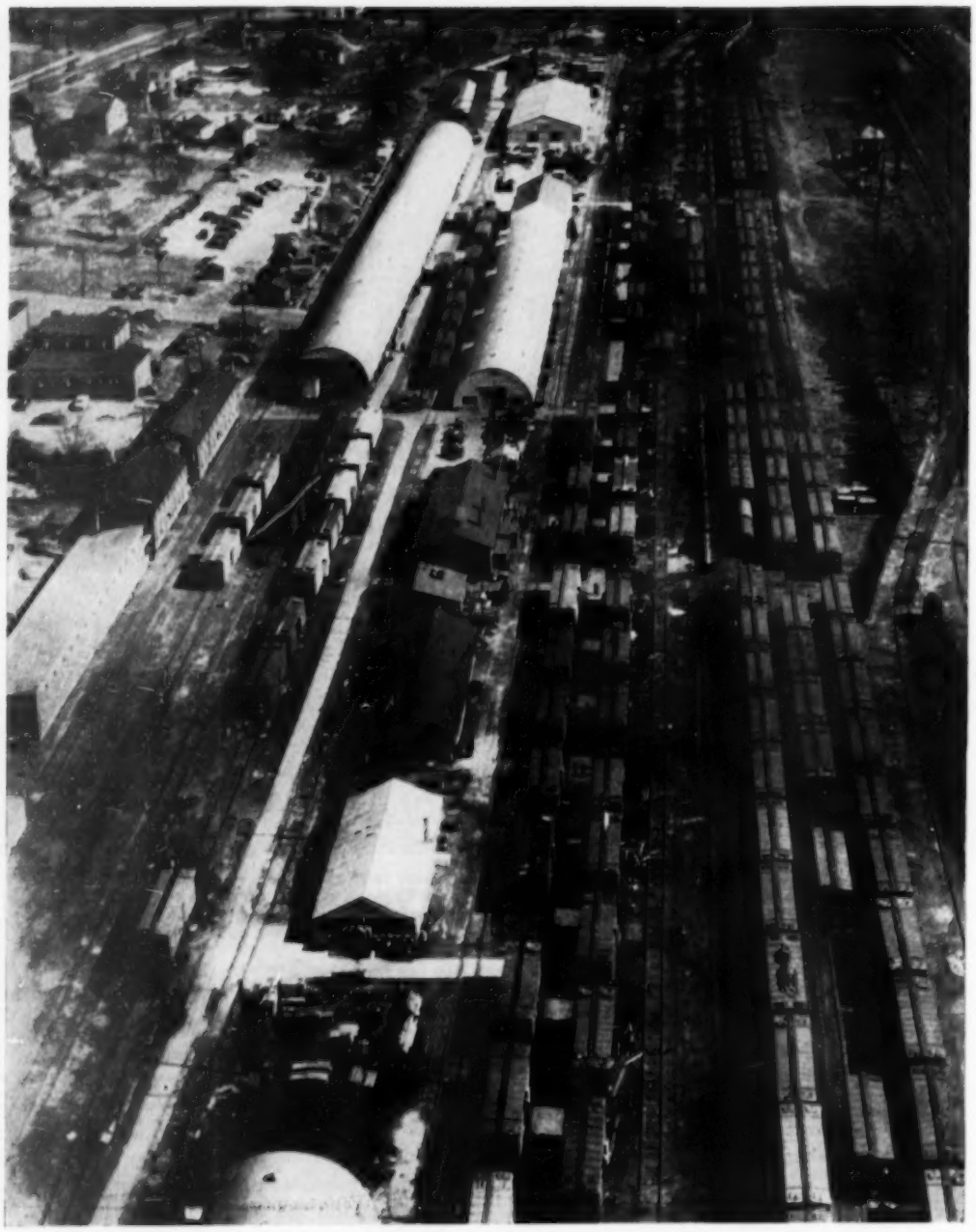
Expansion valves, liquid line solenoid valves, etc. are mounted directly on the side of the evaporator toward the machinery compartment, and are reached from the compartment by removal of an insulated panel in the bulkhead wall. In the bulkhead flue over the evaporator, is mounted a blower motor and fan unit.

These latest type cars include two independent systems under the control of a single thermostat. If one system is damaged, the other will carry the load through safely to destination. Each system includes an evaporator, a condenser, a 5 hp., 2-cylinder, sealed-type compressor and all necessary controls, with FREON-12 as the refrigerant. Two centrifugal-type blower fans are mounted on the blower motor shaft and draw the cooled or heated air upward through the bulkhead duct and evaporator, to discharge it into the ceiling duct. The air then circulates downward through the side and wall flues, to the underside of the floor racks and returns to the bulkhead flue to complete the cycle. The newest models of the "all-purpose" cars are built with air ducts surrounding the loading space so that the circulated cooled or heated air may be diverted into the loading space by opening the adjustable ceiling duct louvers to provide quick cooling, or more uniform temperatures throughout the load, especially when a cargo of fresh produce is being handled.

In these cars, refrigeration equipment is automatic. When the engine is started it operates about 20 seconds to attain running speed before the first compressor cuts in, and it is another 5 seconds before the second is permitted to start. After starting, the equipment operates to bring the car temperature to the thermostat setting where it is maintained from then on, no matter what the outside temperature. Any car temperature from zero to 70 degrees can be established by the thermostat. When set below 20 degrees, refrigeration only is provided. When set in the higher range from 20-70 degrees, either heat or refrigeration, as required, is supplied. Heating and refrigeration circuits are interlocked so that the car cannot heat and refrigerate at the same time. Defrosting of these cars' evaporators is also begun automatically by a defrost clock, once every 24 hours. The defrost period is ended by the thermostat, which opens when the evaporator coil is clear of ice or frost, to re-establish the refrigeration or heating circuit. Defrosting and heating are done by the use of electrical resistance heaters mounted in the evaporator coil. All cars have thermometers to show the car interior temperatures without opening the car doors; and these are used to check equipment operation en route, under load.

Each car has enough fuel capacity for the usual coast-to-coast trip, including pre-cooling and hold-over at destination. These all-purpose cars, with the power plant in continuous operation, will run about 17 days on the initial fuel supply.

While it is still too soon to have exhaustive figures comparing operation of the new mechanical refrigerator cars and standard water-iced cars, it can be said that on the road Fruit Growers Express service is averaging about two loaded trips to one loaded trip by standard cars. To Aug. 17, these mechanical refrigeration cars handled 11,513 loads and had traveled just under 20,000,000 miles under load in the 40 states served by some 70 railroads with which these companies have car supply and service contracts. In 1953 the companies furnished re-



The Alexandria, Va., Fruit Growers Express car shops (upper center) where four all-purpose refrigerator cars are coming off the assembly line daily.

One of the mechanical reefer cars showing the right side. The sliding door uncovering the machinery compartment is on other side.

frigerator cars for 15,797 shipments of frozen foods, of which 4454 were frozen concentrates from Florida. Successfully carried shipments included in addition to the citrus juice concentrates: vegetables, berries, banana puree, cherries, poultry, fish, meat, animal glands, milk, cream pies, French fried potatoes, butter, pineapple juice, grape concentrates, waffles, diced sweet potatoes and turtle meat — all frozen.

The cost factor — with a standard 40-ft. car costing $10,000 and a 50-ft. car $12,500, as against the $21,500 cost of the newer 50-ft. cars — indicates that to achieve success with the new cars there must be full loads and constant use for each car. The steadily increasing use of the new all-purpose cars indicates also that with careful planning such constant use for these diesel refrigerator cars can be achieved, and their use made practical.

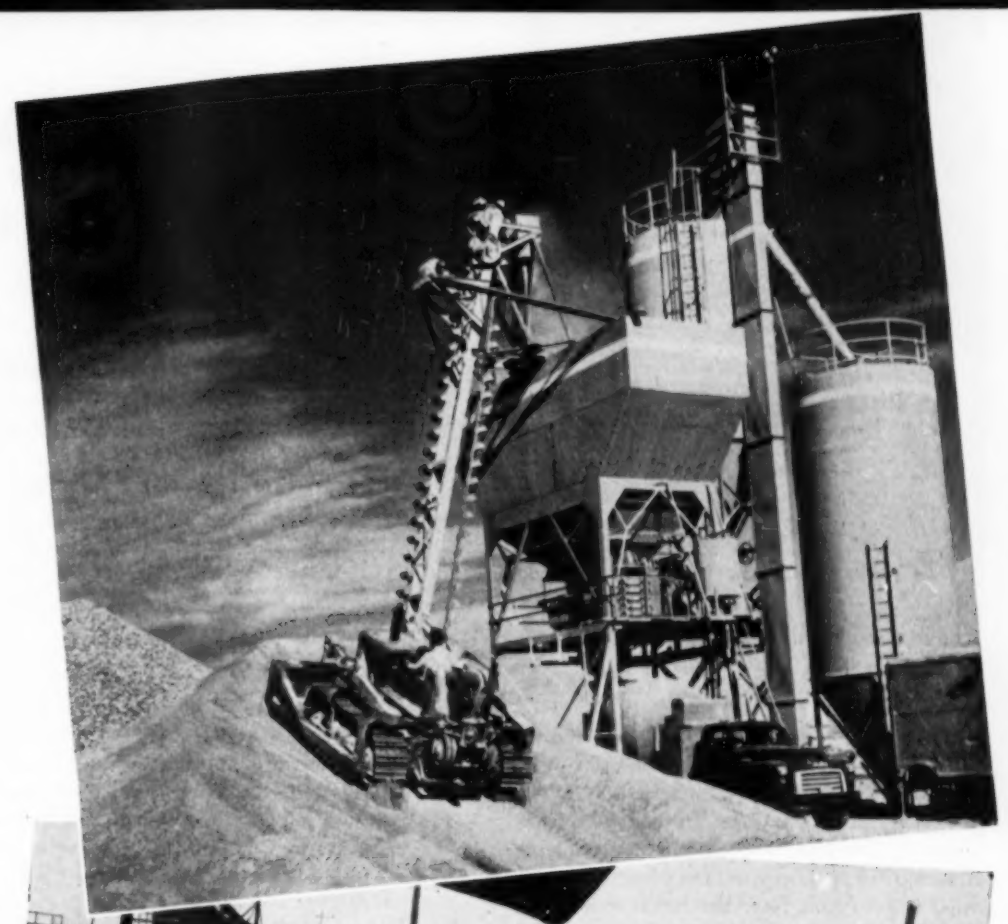
At first, the special servicing required by the diesel refrigerator cars seemed to pose real problems of operation and maintenance. Today, these have been met and generally solved. Employes have been trained within the associated companies. In some instances FGE has provided basic instructions as well as printed instructions on emergency handling, for employes of non-contract railroads over which such cars are sometimes routed. Experience has shown that while the refrigeration equipment of other car lines and railroads in this field is not identical with FGE cars, their qualified and trained personnel can and do adequately handle and service the FGE cars. Strategic stations have been located along FGE's 70 contract railroads' lines, where repair parts are available, and experienced personnel inspects, services and repairs mechanical cars. By test and demonstration with short and long hauls, it has been shown that loads ride safely with proper loading and inspection, 24-hour inspection at terminals or regular icing stations, and with daily inspections at destination when loads are held over for unloading. Basically, it has been demonstrated that the newly designed diesel refrigerator cars are dependable in use and that mechanical difficulties in transit are rare. Cost to the shipper using the mechanical cars is the same as for water-ice cars.

With assembly-line production of the diesel refrigerator cars — a program which developed in response to shipper demand for mechanically refrigerated cars —Fruit Growers Express Co. anticipates a continuing and growing use of the mechanical all-purpose car.

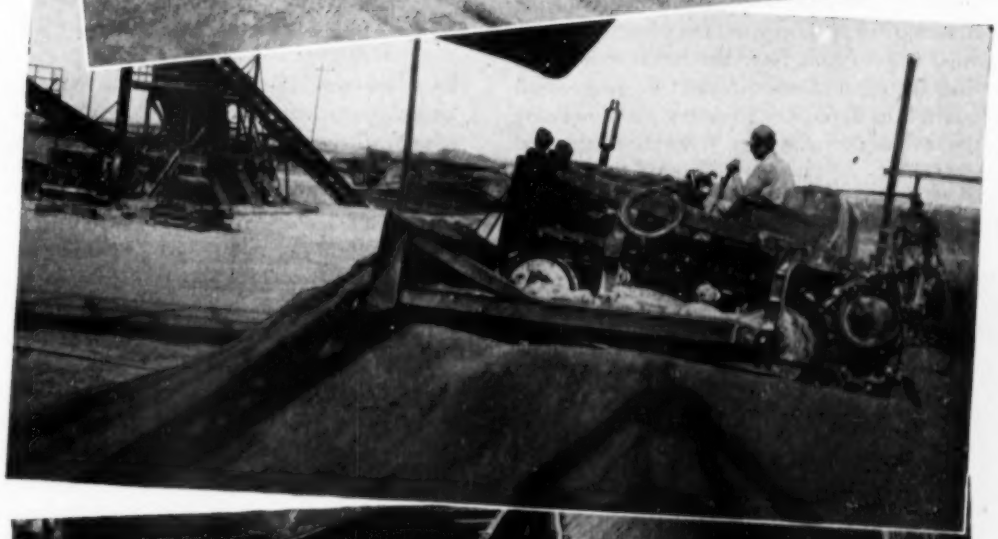
(**Editor's Note:** This is the fourth in a series of articles on the development of mechanical refrigerator cars. In its November, 1953, issue DIESEL PROGRESS described and illustrated Santa Fe Railway's Mechanical Temperature Control refrigerator car. The August, 1954, issue reported generally on three pilot systems developed by Santa Fe, Canadian Pacific and Pacific Fruit Express. The third article, devoted to a detailed description of the Pacific Fruit Express mechanical reefer program, appeared in the October issue of DIESEL PROGRESS.)

WORKING THE ROCK-PILES WITH DIESELS

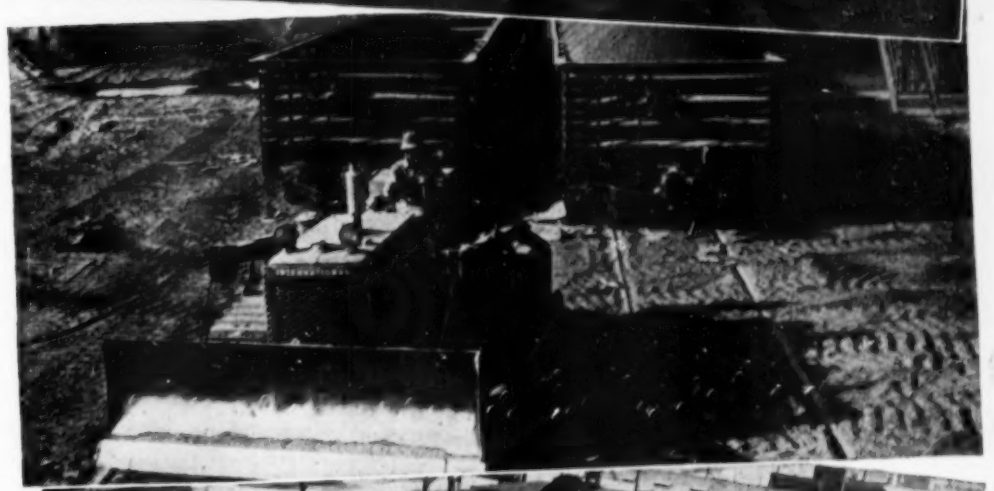
Wherever Construction Aggregates and Cement Mixes Are Produced, There You Will Find Diesel Engines Doing an Important Cost-Saving Job



Top: A big blade load of material is pushed to the top of the stockpile by the International TD-14A crawler tractor owned by Vowell Material Co. of El Paso, Texas. The TD-14A also feeds material into the hopper and does general clean-up work around the yard of this plant, which produces ready-mix for local construction companies.



Peak daily production of more than 2000 tons of crushed stone for construction and concrete work is made possible by this International TD-14A crawler tractor owned by F. M. Reeves & Sons, Inc., of Pecos, Texas. In this picture, made at Reeves' Hobal plant, the crawler is seen stockpiling material dumped by 1½-yard dragline.



Another view of the F. M. Reeves & Sons International tractor showing it moving a loaded railroad car from the bin to a siding. It is also used for yard clean-up working and occasionally for stripping overburden from the nearby pit. Two International UD-24 diesel engines are also used in the Hoban plant. One powers a Symonds 4-ft. primary crusher, the other a Symonds secondary crusher.

It's an up-hill push rehandling 950 yards of sand daily from stockpiles to loading bin at the Century Rock plant in El Monte, Calif. An International TD-18A and bulldozer keeps the plaster sand, unwashed sand and concrete sand flowing into the hoppers.

W. J. Isbell, vice president of Isbell Construction Co., Reno, Nev.

ISBELLS DO A DIESEL STRIP

Pioneer Road Builders Perform a Tough Overburden Removal Job to Uncover a Mountain Sulphur Mine in California

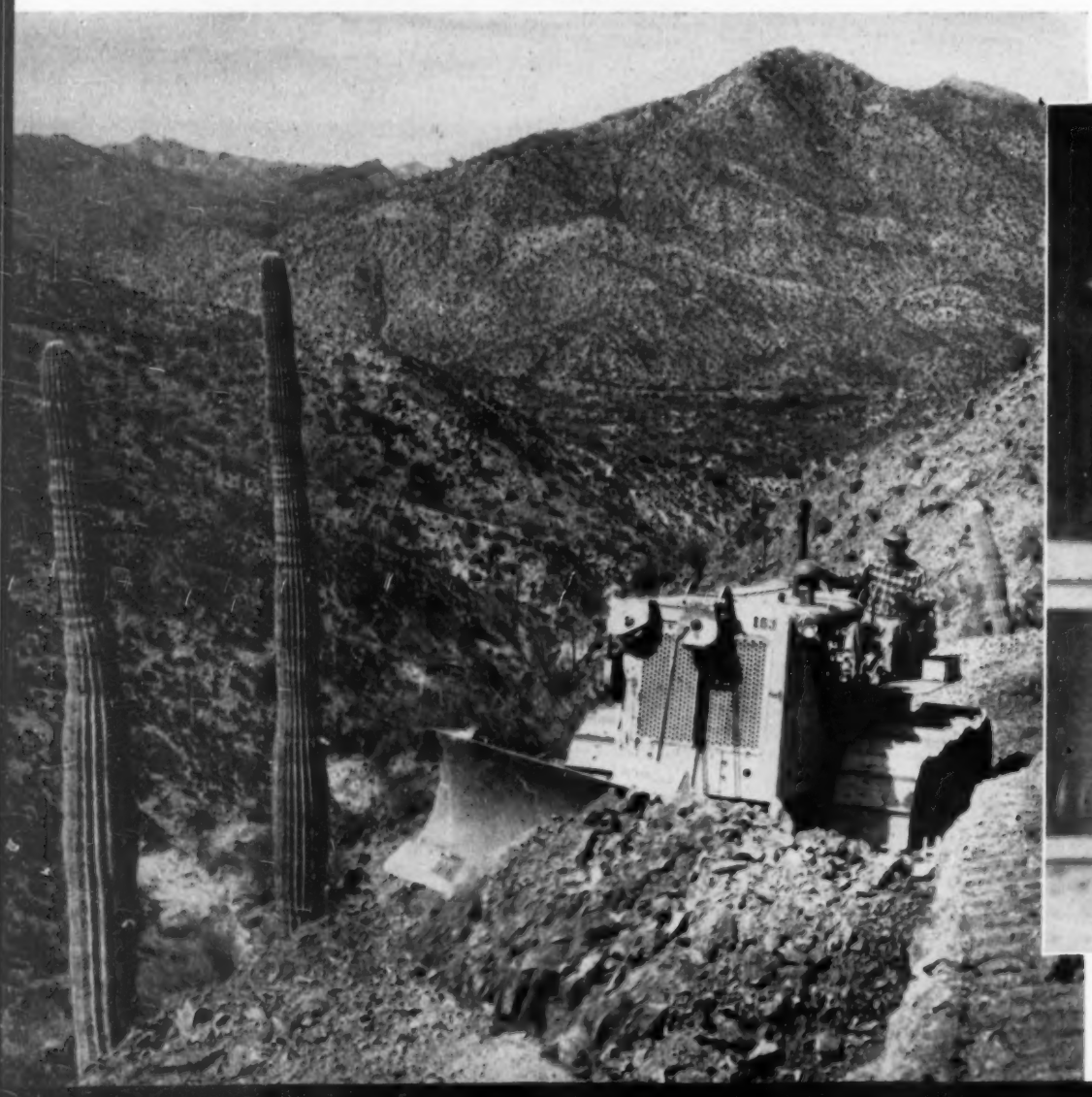
By F. HAL HIGGINS

THE first step in a giant mine-and-mix operation that sets new high standards of engineering efficiency is done. This is the uncovering of the Leviathan sulphur mine for supplying Anaconda's big copper mining processing operation at Yerington, Nev. And it was no accident that the Isbell Construction Co., with headquarters in Reno, was given the job of building the road to the mine, high in the mountains and over the border in California's Alpine county. The Isbells, father and four sons, have made dirt-moving history in the West since the Civil War. The late John W. Isbell was active in the firm until his death a few months ago.

Over the past 15 years the Isbells have had ample opportunity to prove that their long, sound experience has given them the know-how to adapt road building and dirt-moving techniques and equipment to mining—to speed it up and to make profitable strip mining of low-grade ores not practical with old methods and equipment. They have taken on stripping jobs for such giants as Kennecott and Anaconda.

The Leviathan, in the eastern foothills of the Sierra Nevada mountains near Markleesville,

An Isbell Caterpillar diesel tractor carves a mountain road to one of the company's mine stripping jobs. The Isbells operate some $2,000,000 worth of dieselized equipment in several states.



Engineer on stationary Cooper-Bessemer diesel that supplied power for big electric shovel loading trucks at Leviathan mine. Note lube and grease barrels handy for service.

Calif., is an important factor in the operation of Anaconda's Yerington mine because it furnishes the sulphur needed to make sulphuric acid, the chemical used to leach the copper from the mine in Nevada. Anaconda purchased the Leviathan in 1951 and early the next year started to develop it as an open pit operation. The Isbells contracted the stripping of more than 19,000,000 tons of barren overburden.

To see an Isbell strip job in action is quite an experience. It is a perfect example of how the organization equips and mans its carefully calculated engineering jobs. The Isbells have demonstrated their ability to cut costs and insure profits by using bigger and faster machines powered by diesel engines.

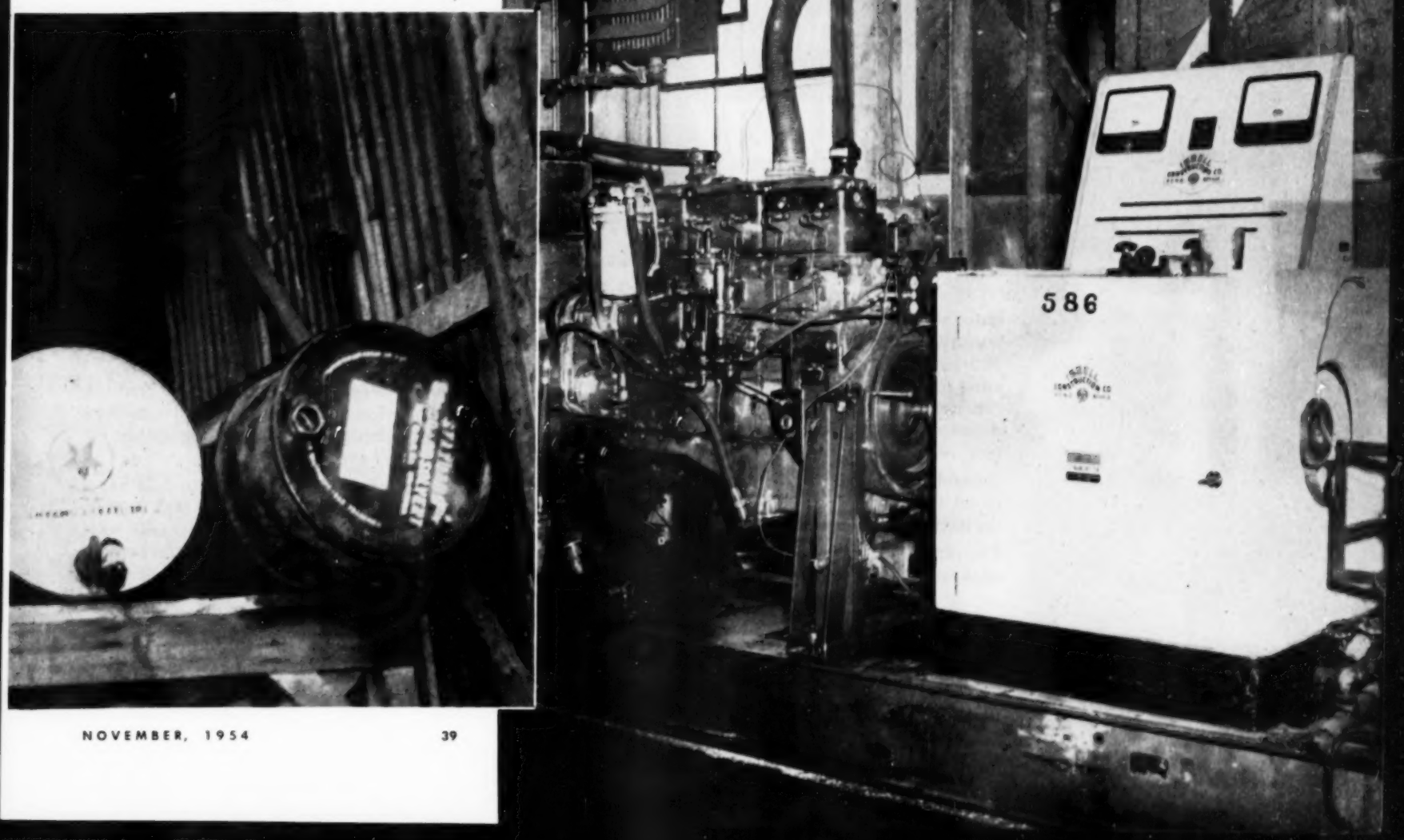
After leaving the main Isbell office in Reno, where I picked up some pointers from Vice President W. J. Isbell, I went out to see the job in progress. On the way up to the mine, over a road being built by an Isbell construction crew, we passed a Caterpillar D8 and a blade grader at work shoving trees into a fire at the side of the road. At the office, about a mile from the open pit stripping work on top of the mountain, we met the acting superintendent, Ellis Fielding, and his assistant, Joe Baxter. Fielding took us out to see the equipment in action—shovels, trucks, blade graders, drills and a stationary Cooper-Bessemer diesel housed atop the mountain to power the big P & H shovel below. Two shovels were loading trucks. Equipment on the

P & H shovel at Leviathan mine loads a Euclid truck powered by a Cummins diesel. The Isbells own more than 100 Euclids, mostly with Cummins and GM diesel engines.

job included a model 20B Bucyrus-Erie electric shovel, a P & H shovel, 2 Northwest 80 shovels, 12 Euclid trucks, 4 Caterpillar D8 tractors, a Cat No. 12 blade grader and the Cooper-Bessemer diesel powering the electric shovel.

Once the Isbells had removed some 9,000,000 tons of overburden, uncovering a part of the sulphur ore, Anaconda began mining the ore with a 1½-cu. yd. diesel shovel loading 6-yd. Dart trucks. The ore is hauled to a loading bin where it is reloaded for the trip to the Yerington plant nearly 60 miles away. Wells Cargo has the hauling contract. By February of this year, Wells Cargo had hauled more than 135,000 tons of ore to the plant stockpile, which is maintained so that sulphur ore will be available when winter snows cut off the supply from the mine. The Leviathan is at an elevation of 7000 to 7500 ft. The sulphur occurs in beds of volcanic rock as a blanket about 100 ft. thick. The ore contains 25 to 30% sulphur, most of which is elemental sulphur impregnating and replacing the volcanic rock. General Manager A. E. Millar of the Yerington mine directed the development of the Leviathan, assisted by Mine Superintendent H. R. Burch. F. A. Keith is directly in charge of the Leviathan as Anaconda's representative.

As diesel engines come into the big Isbell shop in Reno for overhaul, rebuilding and general service, they are thoroughly tested. Here a test is run on a Cummins engine, one of more than 70 owned by the construction firm.



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Electric Utility Companies

Electro-Motive Power

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General Motors railroad units today equal *one-sixth* of all the country's installed electrical generating capacity.

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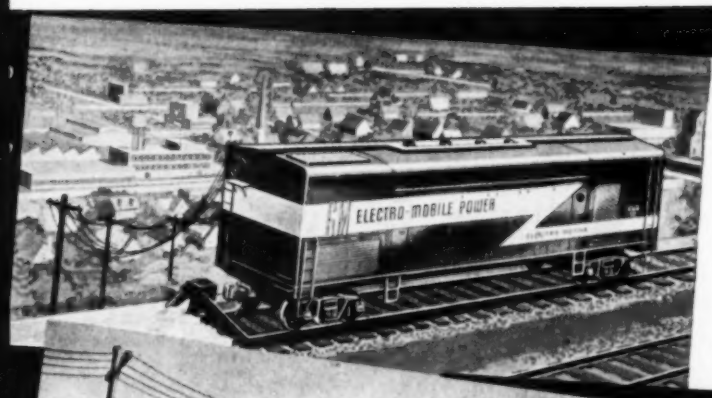
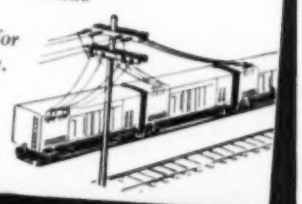
We believe that here the electric utility field has a new and remarkably adaptable tool that will fit many problems in an unusually economical way. We'd like to discuss with you the potential benefits Electro-Mobile Power may hold for your specific needs.



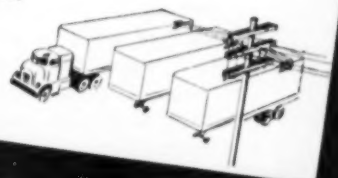
RAIL CAR

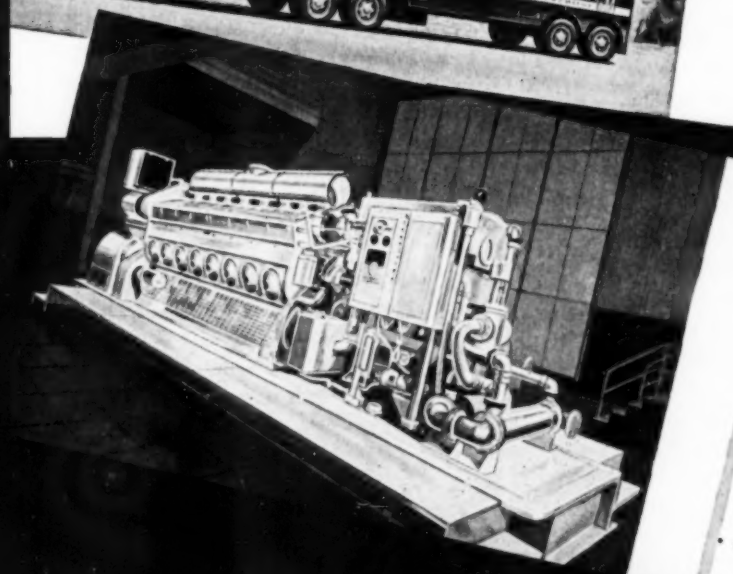
1,000, 750 and 500 kw units for use on sidings, or placed on piers for semi-permanent use.



TRUCK TRAILER

500 and 350 kw units to move on highways to desired sites.





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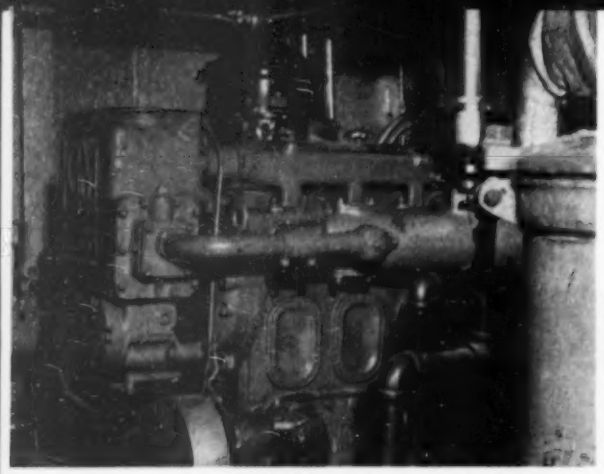
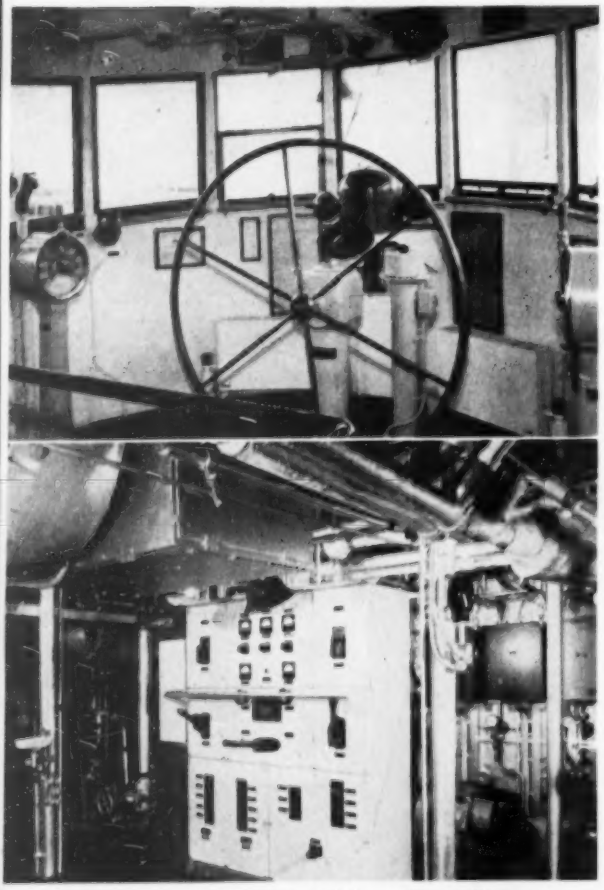
GENERAL MOTORS

LA GRANGE, ILLINOIS



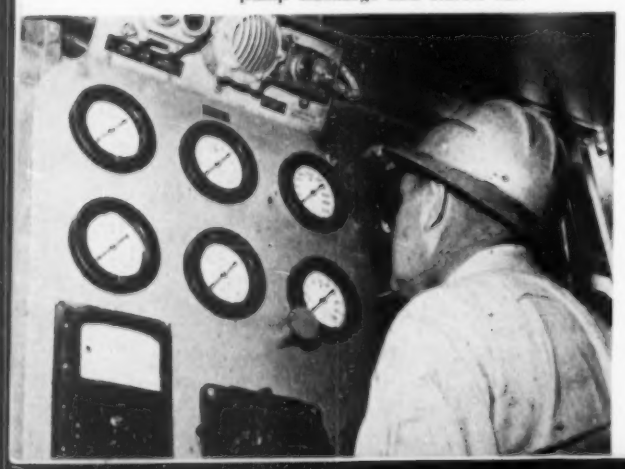
Diesel end of fire and salvage unit, showing GM model 3061A engine which drives a Star-Kimble dc. generator.

Wheel house design of LT class harbor tugs affords maximum visibility. Chart table and radio installations are in after end of this room.



Looking forward from Cooper-Bessemer to switch panel and air compressors (right). Main engine intake filter silencer and part of supercharger are shown upper left.

Monitor panel for main engine, including propeller revolution indicator by Electric Tachometer Corp. and Bristol Co. pyrometer. Pressure gauges are for lube oil, fresh water, engine inlet and fuel oil, cooler inlet, salt water pressure pump discharge and starter air.



SCENE: Yards of San Diego's National Steel and Shipbuilding Corp. Event: Erection of a 100-ft. steel tugboat. As you watch, four 30-ton cranes slowly lower a big diesel engine onto its bed, welded to the naked, inner bottom of what one day will be a 12-knot tugboat.

The engine placed, the cranes move to the tug's stern section. The massive stern, like the bow and most other sections, has been fabricated in a jig upside down, the jig moved in line with the inner bottom, the only important section fabricated keel up. The four cranes slowly rotate the stern section through 180 degrees until, keel down, it eases into place aft of the diesel-installed midsection. That done, cranes hook onto the forward section, likewise fabricated upside down and moved into line with the inner bottom. The bow section is rotated until, keel down, it slips in ahead of the midsection. That's how one tugboat after another is being born in National Steel and Shipbuilding's San Diego yards. It's a new subassemblage technique — applied to a new-type, dieselized tugboat, the LT class.

NASSCO is currently testing the third of 13 all-steel harbor tugs it is fabricating for the U. S. Navy Bureau of Ships. Though contracted through the Navy, the eight million dollars worth of towing power will be delivered to the U. S. Army Transportation Corps for use at various Army marine installations on the Pacific Coast. Each tug is 100 ft. long, has a 26 ft. 6 in. beam, a 390-ton displacement and a single, 7.667 ft. diameter, 4.5 pitch propeller directly driven by a Cooper-Bessemer model LS6-DRT, 6-cylinder, supercharged diesel engine. Engine has a bore of 15½ in., a stroke of 22 in. and is rated 1200 bhp. at approximately 300 rpm. The air-start, direct reversible marine engine is coupled through a Kingsbury thrust bearing to the shaft and propeller.

The 13 LT class tugs being launched one every month at NASSCO are among 65 being built in shipyards coast-to-coast. Of 22 LT tugs currently under construction, two are on the ways of John E. Matton & Son, Waterford, N. Y. Higgins, Inc., New Orleans, is fabricating seven. Forty-three others—part of a previous contract —have already been delivered. They are powered by Fairbanks, Morse engines. Of these, Higgins, Inc. built 14; 29 were launched by Avondale Marine Ways, West Wego, La. The LTs are versatile. Although designed as harbor work-horses, they can also salvage and fight maritime fires. Mounted topside are three monitor fire nozzles, two on the after boat deck, the other atop the pilot house. Squat, low-riding (with a 3 ft. 8 in. minimum freeboard, an average 10 ft. 9 in. draft), the LTs look powerful—and they are.

Source of that power is the Cooper-Bessemer main engine. Step down the engine room ladder and you understand the reason for those 12 knots, even when fully loaded. Installed along the center line, its air-intake and exhaust venting upward through the fidley and false stack, is the Cooper-Bessemer. Forward of the engine is a switch panel (the engine room's electrical monitor) and two air compressors. These furnish 250 psi. air for engine starting (supplying two starting air tanks, aft of the engine, both 29½ in. O.D., 123½ in. long, with a working pressure of 270 psi.). Compressors also furnish air for the tug's whistle and service air, used at the engine room's maintenance bench.

Air compressors are compact, the compressor V-belt driven from a Reliance CT-284, 7½ hp., 1750 rpm. marine-type electrical motor, mounted on the same base. Compressors are Worthington model 7½ ESM, 2-stage, air-cooled, delivering 23 cu. ft./minute at 250 psi. They're equipped with automatic unloaders and intake silencers.

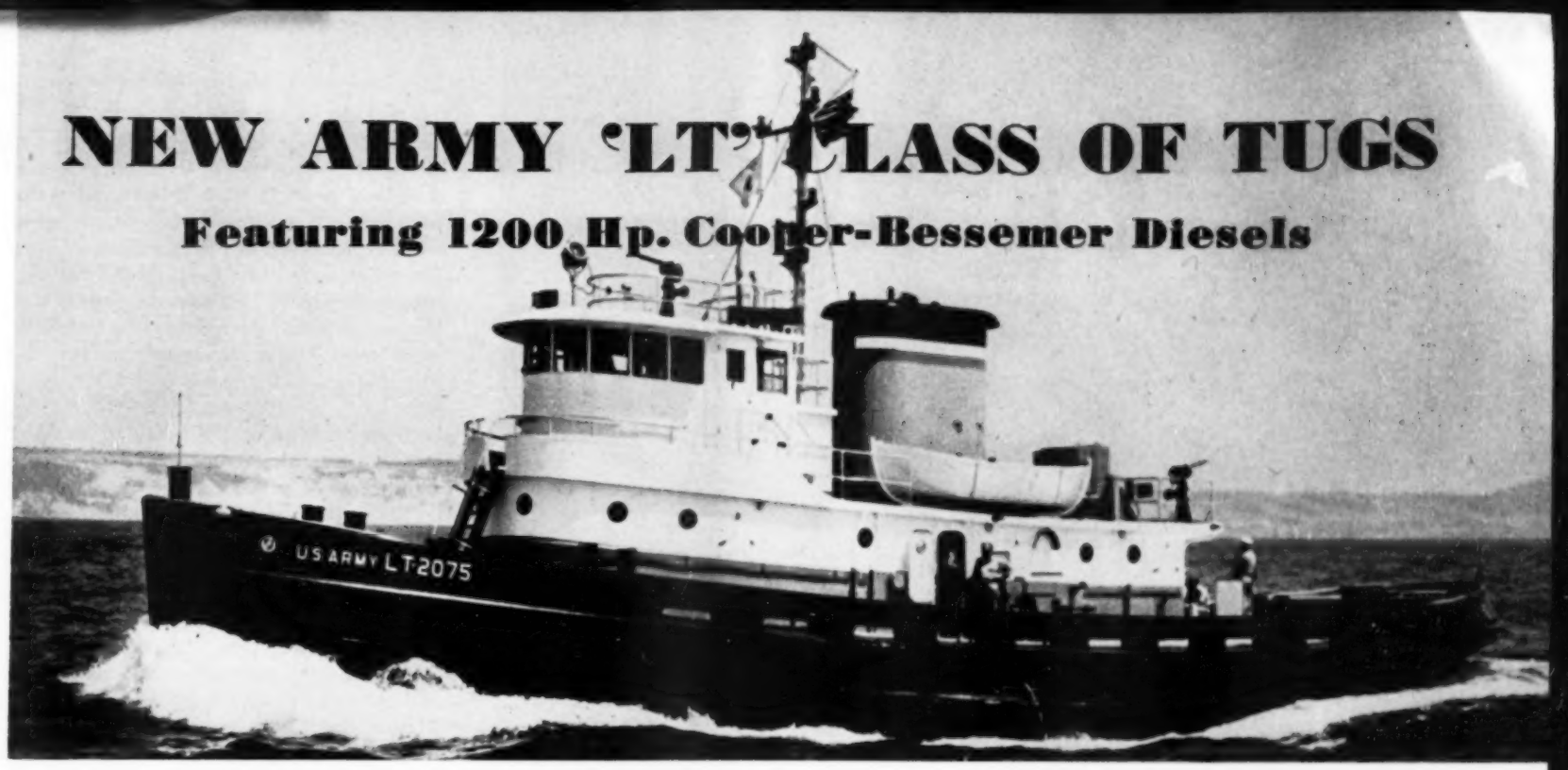
To port and starboard of the main engine are two fire and salvage pump units, both Dean Hill, horizontally split case, centrifugal pumps, rated 500 gpm. at 100 psi. Both draw salt water from separate sea chests, and their intakes are filtered by duplex strainers. Although both units are identical, they supply different standpipes leading above deck to the pedestal-mounted fire nozzles and to salvage fixtures, where lengths of flexible tubing can be attached for suction. Each fire and salvage unit is powered by a GM model 3061A, 3-cylinder, 2-cycle diesel engine, with a 4¼ in. bore by 5 in. stroke, rated 60 bhp. at 1450 rpm. The diesels direct-drive Star-Kimble shunt-wound, 120-volt dc. marine-type generators, rated 40 kw. These furnish the tug's electricity, direct current, monitored from the engine room's Whitmore switchpanel. In addition, each GM is clutch-connected to a Dean Hill pump.

Each diesel generator pump unit is self-contained. Each has four Exide #XQ-23, 6-volt starting batteries, battery charger with voltage regulator, fuel and lube filters, hydraulic governor, instrument panel, fresh water cooling system (including fresh and sea water pumps), heat exchanger and a Maxim exhaust silencer.

Aft of a Fairbanks-Morse fire pump is a lube oil standby pump—a 175 gpm. at 35 psi. DeLaval, powered by a Star-Kimble 10 hp., 1750 rpm., 115-volt, dc. motor. Nearby is a lube oil standby strainer. The lube oil storage tank, hung just above the port diesel generator-pump set, has a capacity of 450 gallons. LT class tugs have below-deck fuel oil storage for a total of 20,336 gallons (63.2 tons) in four tanks. There's also tankage for 2756 gallons (10.2 tons) of potable fresh water. In the fidley (that section directly above the Cooper-Bessemer but below the false stack) are housed a 300-gallon fuel oil day tank, 30-gallon galley tank (holding diesel oil for the galley stove) and a 50-gallon emergency fuel oil tank. A 5 cu. ft. air tank for the ship's whistle is also located in the fidley. Each generator-pump unit has two silencers: one, a Maxim 3 in. MUC #6, is in the engine room and the other, a Maxim SCF 24 in., in the stack. Also located in the stack is the main engine's exhaust silencer, a Maxim SCF, 24 in. The main engine's intake filter silencer (an Air-Maze type FE3515) is in the engine room.

NEW ARMY "LT" CLASS OF TUGS

Featuring 1200 Hp. Cooper-Bessemer Diesels

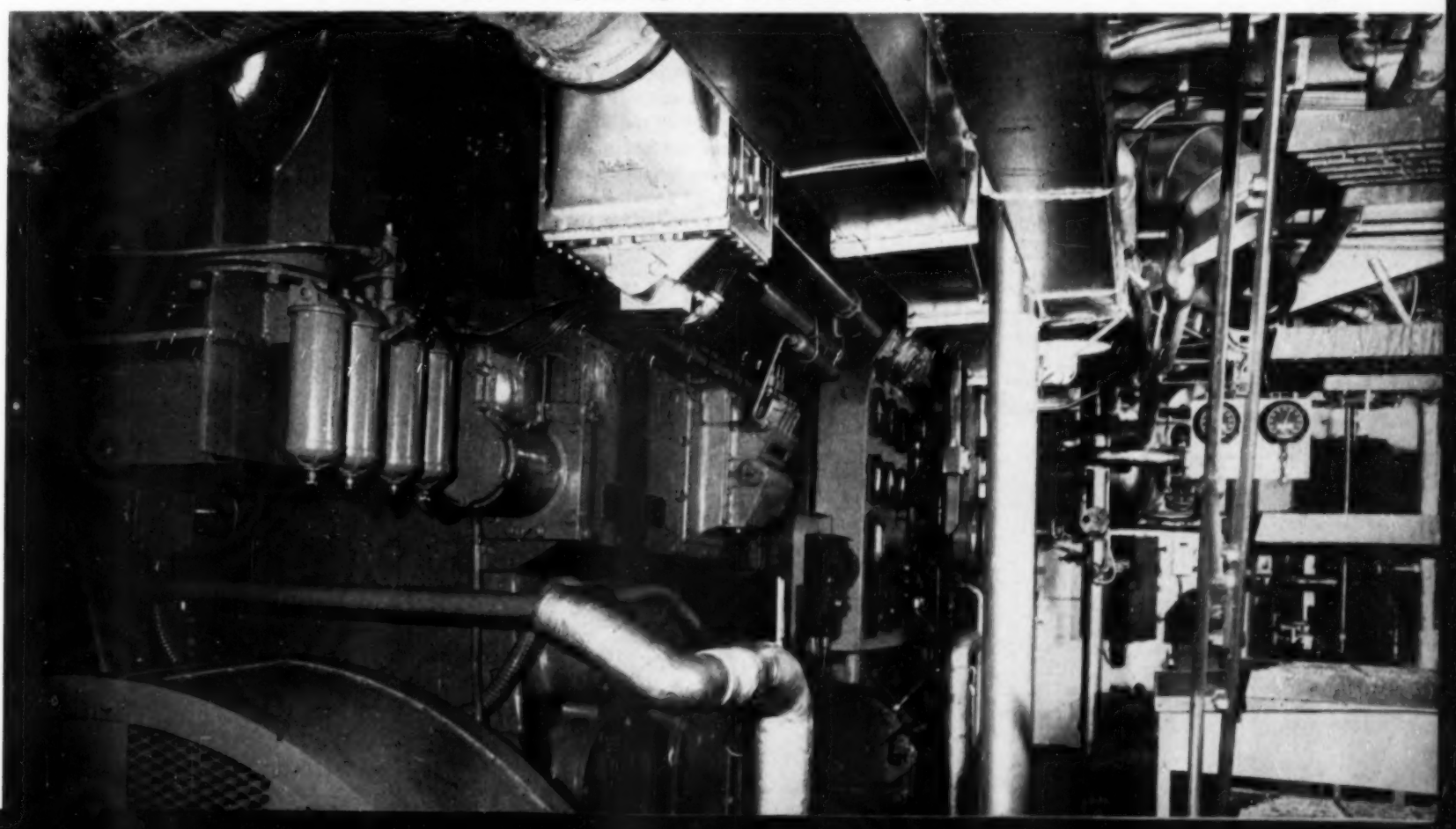


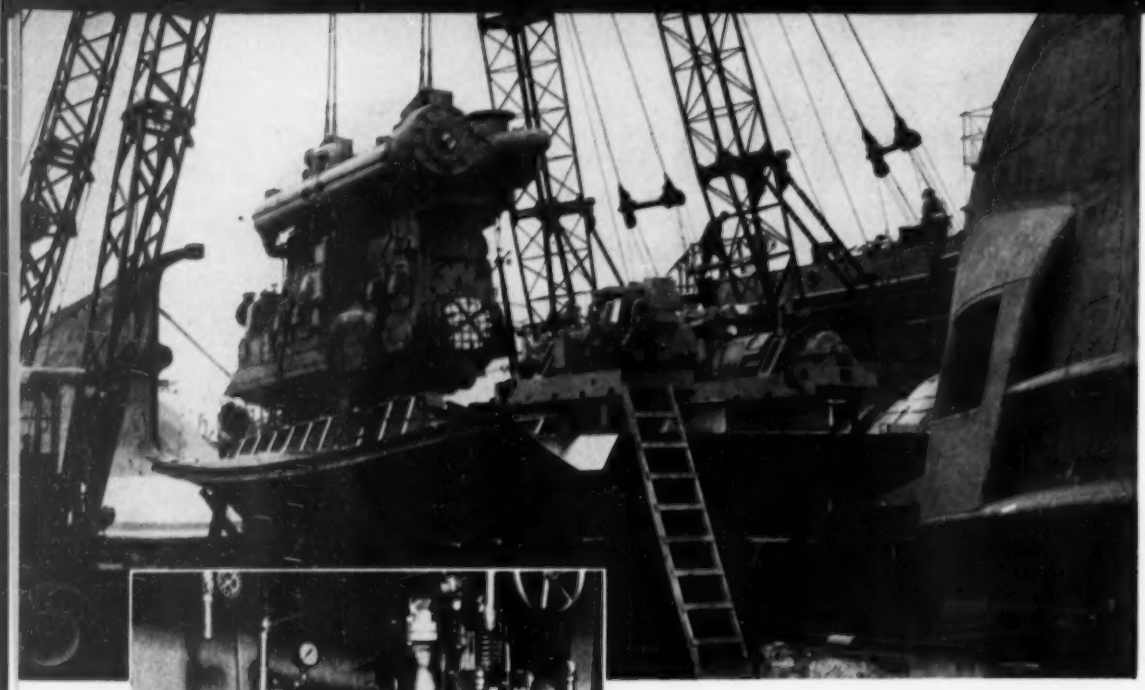
By JAMES JOSEPH

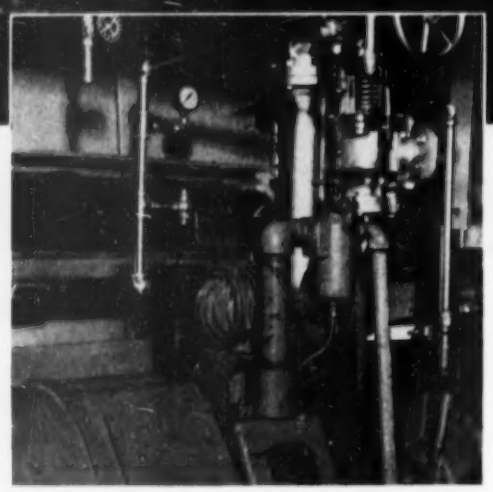
The Cooper-Bessemer, of course, employs the manufacturer's "controlled pressure" fuel injection system, with common triplex plunger-type high-pressure fuel oil pump and individual cam-operated cylinder injection valves and nozzles. Each cylinder head has four valves: two inlet, two exhaust. Intake air entering through the Air-Maze filter passes to an engine exhaust gas-operated turbocharger (Buchi-Elliott type), thence to a Young Radiator "after cooler," which cools air leaving the turbocharger and prior to its entering the manifold. "After cooling" is designed to up oxygen content, since hot air has less oxygen than cool. The after cooler consists of a set of coils cooled by circulating salt water. The 18 in. long after cooler presents no restriction to incoming air. Air drops about 20° F. across its coils.

Lube and fuel oil cooling is accomplished by two separate but associated systems: soft or treated water circulating through the engine jackets and heat exchanger; raw water circulating heat exchanger and lube oil cooler. Lube oil is cooled in a closed system. Lube temperature is maintained at normal, rated levels by a Ross heat exchanger working with a Viking pump. Since the engine is the dry sump type, it has a sump (300 gallons) forward and beside the engine. A transfer pump to this tank is the built-in type and pumps return oil from the base back to the sump tank. A built-in oil pressure pump draws from the sump, discharging through the oil cooler and full flow

Looking aft along the Cooper-Bessemer diesel. Note Young aftercooler for the Buchi-Elliott supercharger, center top, and Nugent lube oil filters immediately to the left.







Cooper-Bessemer is lowered onto its bed on keel-down, inner bottom section of vessel.

Port fire and salvage diesel-generator set, showing Dean Hill pump, Star-Kimble dc. generator, Kraisal priming pump and Exide starting batteries (in background).

filter into the oil header inside the engine frame. A pressure regulating valve located near the entrance of the oil header maintains desired oil pressure on the system and also by-passes surplus oil back to the sump. Installed in the cooling line is a relief valve, permitting oil to be by-passed around the cooler should it become clogged for any reason. A check valve in the pump suction line insures that the pump retains its prime during periods of shutdown.

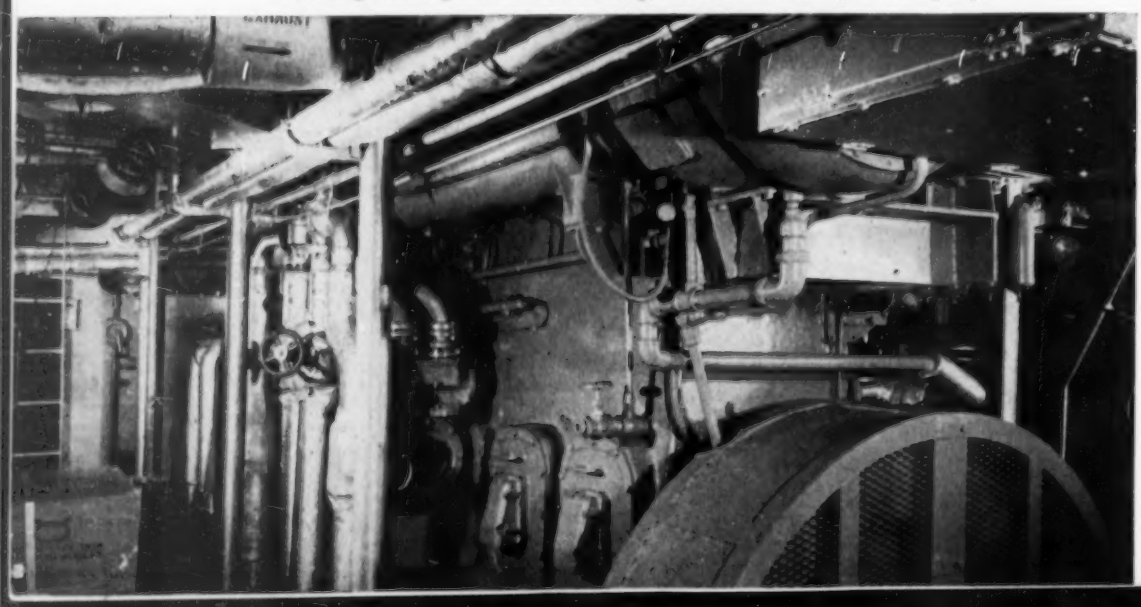
The Cooper-Bessemer, functioning as a marine engine, has no governor. Instead, it is operated directly by a hand throttle, located on the engine's port side. The engine operator's instructions are "telegraphed" from the pilot house. Operator manipulates control and throttle handle, which can be advanced and returned from forward to stop, then to reverse position. Engine is stopped by shoving the control and throttle handle to "stop" (which is also neutral position). This control also actuates air starting. At his left is an engine monitor panel, and to the left of that, an alarm panel. Gauges on the main engine monitor panel indicate pressures for lube oil; fresh water at engine inlet; fuel oil; lube oil at cooler inlet; salt water, pump discharge; and starting air. An adjacent alarm bell sounds and its associated lights go on if jacket water exceeds 180°F. or lube oil pressure falls to 7½ psi.

The engine is hand-throttled. This throttle is directly connected to the fuel injection control shaft, regulating fuel to the engine. Also, the throttle is connected to a fuel pressure regulator, automatically increasing fuel pressure with an increase in load and speed, giving maximum pressure at rated speed (12 knots, at approximately 300 rpm.). There is, however, a Pickering overspeed governor, set for about 110% of rated maximum speed. It opens a fuel dump valve, lowering fuel pressure and reducing speed, but does not necessarily shut the engine down. The governor is of the mechanical flyball type with an adjustable spring on the outside of its housing for setting the speed at which the overspeed works. Under the engine room floor is a 70-gallon fuel oil drain tank.

Each engine cylinder and exhaust manifold is fitted with a thermocouple, each connecting to an 8-pt. rotary switch and indicator, mounted on the engine's instrument panel. Pyrometer is product of the Bristol Co.

National Steel and Shipbuilding Corp. has launched five LT class tugboats to date. All 13 will be delivered by July, 1955. And all are being fabricated by the upside-down sectional method, and sent down the ways finished, ready for trials. This method, called "heavy launching," is possible through NASSCO's sub-assembly technique, with outfitting done ashore. Since October, 1951 the shipyard has launched 111 vessels of various designs. The new-type LT tugboats, costing about $650,000 apiece, are considered among the most efficient and powerful for their size yet to be built under the Navy's Bureau of Ships. M. Rosenblatt & Son of New York, naval architects and marine engineers, are the design and procurement agents for these vessels.

Looking aft along starboard side of engine room. Note Viking lube oil pump.

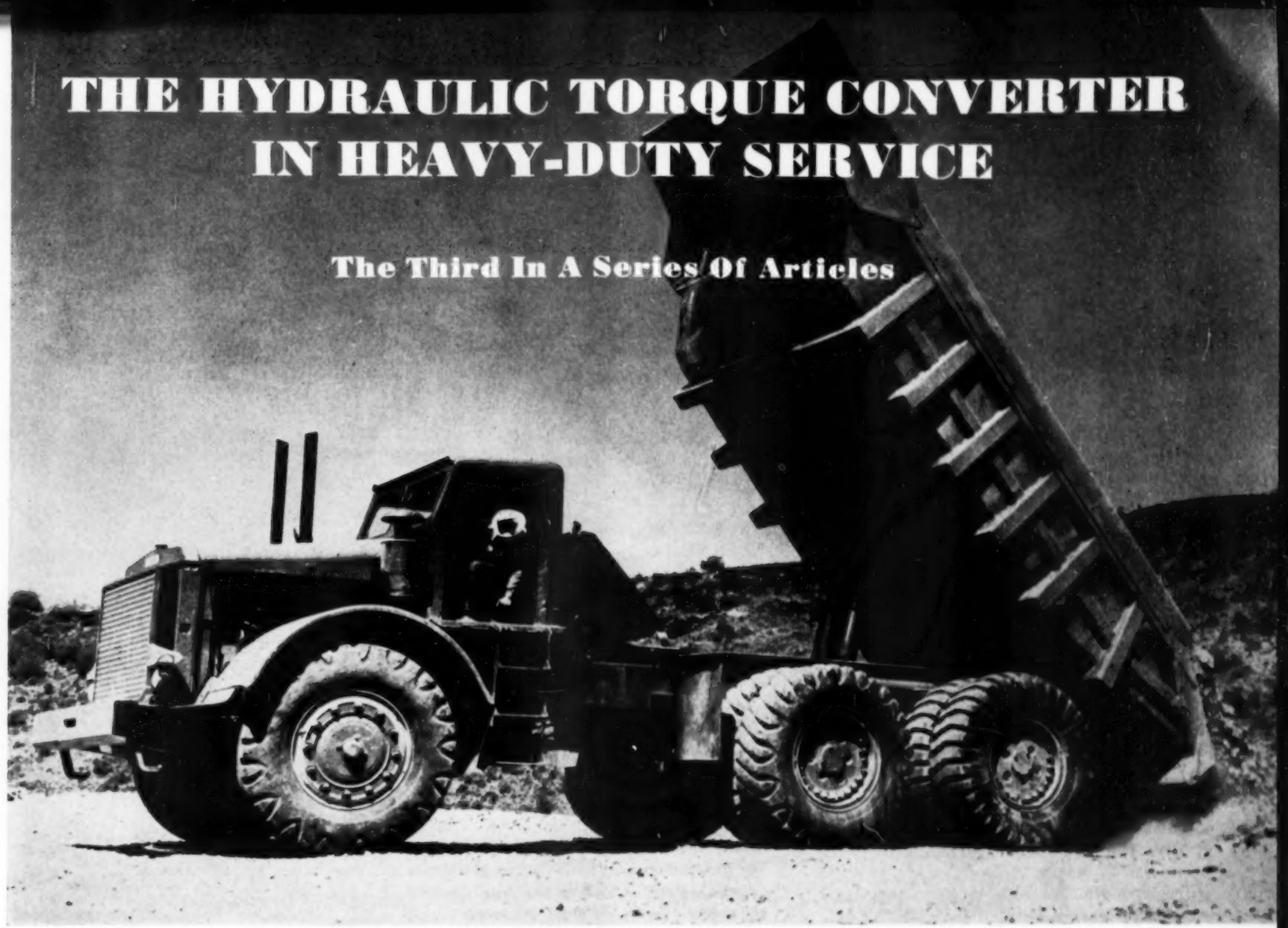


List of Equipment

Engine—Model LS6-DRT, 6-cylinder, 15½-in. bore, 22-in. stroke, vertical, in line, 4-cycle, super-charged, F. W. cooled, air starting, direct drive, rated 1200 bhp. at 300 rpm., Cooper-Bessemer Corp.
Turbocharger—Buchi-Elliott.
After coolers—Young Radiator.
Air compressors (for air starting) — Worthington.
Fuel oil filters—Purolator.
Fuel oil transfer pump—Fairbanks-Morse.
Fuel oil hand pump—Blackmer.
Fuel injection nozzle—Bosch.
Lube oil cooler—Ross.
Lube oil bleeder filter—Nugent.
Lube oil purifilter—DeLaval.
Lube oil hand pump—Blackmer.
Air intake filter silencer—Air-Maze.
Engine exhaust muffler—Maxim.
Audible and visual alarm panel—Viking.
Shaft revolution indicator system — Electric Tachometer Corp.
Main switchboard—Whitmore.
Pyrometer—Bristol Co.
Main engine limiting speed governor — Pickering.
Fire-salvage diesels — 2 GM model 3061A, 3-cylinder, 4½-in. bore, 5-in. stroke, rated 60 bhp. continuous at 1450 rpm.
Fire-salvage generators — 2 Star-Kimble 120-volt, dc., marine-type, rated 40 kw.
Fire-salvage exhaust silencers—Maxim.
Fire-salvage starting batteries—Exide.
Naval architects—M. Rosenblatt & Son, New York.

THE HYDRAULIC TORQUE CONVERTER IN HEAVY-DUTY SERVICE

The Third In A Series Of Articles



This Allison Tormatic-equipped 50-ton Euclid 1LLD hauls up 10% grades at the same speed as trucks carrying only 20-ton payloads. Two converter-transmission teams transmit power from the twin engines to the two driving axles. The converter absorbs shock loads, protects engines and drivelines from damaging shocks.

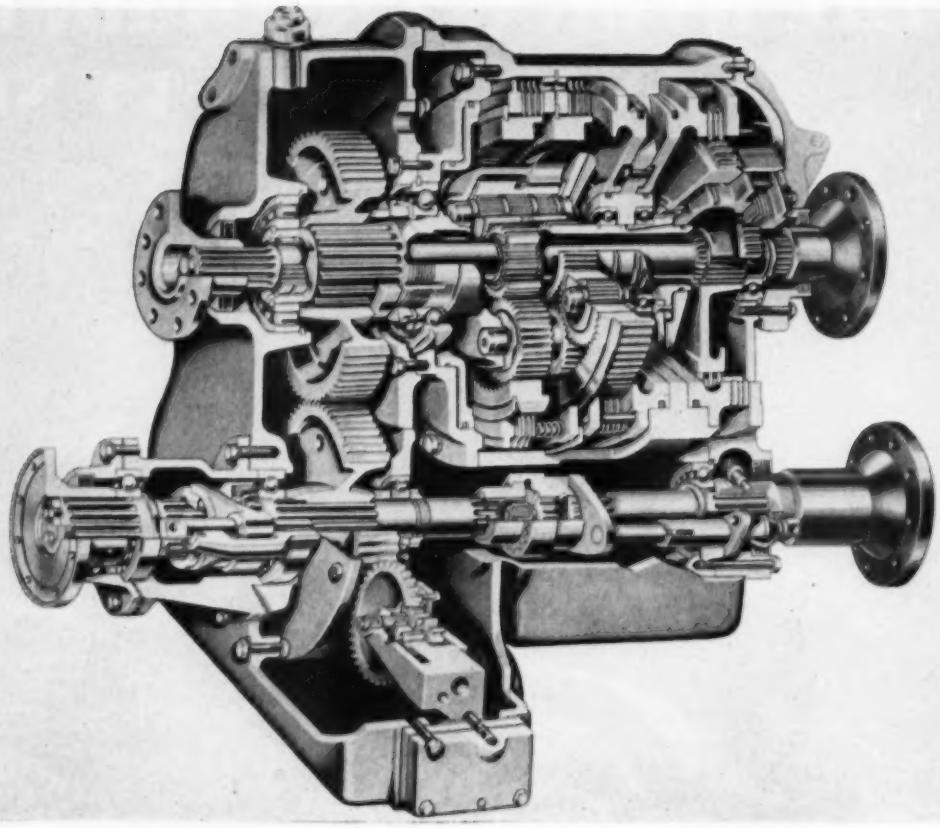
SINCE World War II, the transmission operations of General Motors' Allison Division in Indianapolis has built more than 50,000 Torqmatic Drives for heavy-duty service in the military and industrial fields. Backed by vast experience in the development of hydraulic transmissions, Torqmatic Drives are helping operators to do more work at less cost in the earth-moving industry, oil fields, rail and bus transportation, quarries, and on water. Even on the battlefields of Korea it saw plenty of action. In performance of these varied assignments, Torqmatic Drives are found in 60-ton tanks, 75-ton payload vehicles, city motor buses, rail cars, draglines, shovels, cranes, atomic gun carriers, tank retrievers, tractors, scrapers, loaders, boats, oil fields' mobile servicing units, and many other types of equipment.

Torqmatic Drives is Allison Division's trade name for its hydraulic TC torque converter, TG transmission, RC transmission, hydraulic brake and marine gear. All, with the exception of the marine gear, use the hydraulic torque converter. When World War II drew to a close, and engineering and manufacturing skills could be turned once again to peace-time economy, one of the assignments General Motors gave the Allison Division was the development of a hydraulic torque converter transmission for heavy-duty use in the industrial and military fields. In reviewing their assignment, Allison engineers could do either one of the following—or both: (a) Build a hydraulic torque converter with high torque ratio; (b) Build a hydraulic torque converter which would have a wider range of application with lower torque ratio, capable of operating as fluid-coupling and torque multiplier.

After much research, field investigation and field testing, the engineers reached these conclusions: Except for city bus operation, which requires high torque for frequent starts, the lower torque ratio converter was better adapted for a wider range of operation. The lower torque ratio converter, which included an automatic transition to fluid-coupling, made possible greater operating economies. And, perhaps most important, the hydraulic torque converter made it possible to develop an entirely new type of heavy-duty transmission which would require only two to three forward speeds, instead of the usual 5 to 15 speeds. The conventional clutch was obsoleted.

The first commercial application was the famous "V" Drive Transmission incorporating a high torque ratio converter (2-stage turbine) with direct drive clutch for the city bus. All the driver had to do was step on the gas and the transmission took over the job of shifting the gears automatically. It freed the driver for his other duties. While the V drive was under development, a new type of transmission for military use in tanks was being engineered. This new transmission had to incorporate not only the automatic torque multiplication and coupling features and range gearing in one package, but it also had to contain the steering and braking mechanism. Thus came into being the famous CD-850 Cross Drive Transmission for the General Patton tank which gave such good account of itself in Korea. This was followed by other military type transmissions for track-laying and wheeled vehicles. Although the V drive and the military transmission incorporated the hydraulic torque converter within the same housing as the range gearing, it was decided that for greater flexibility of installation and operation, the low-ratio torque converter

A model K-595 Link Belt Speeder with 85-ft. boom and 2½-yard bucket, and equipped with an Allison converter, stripping coal for the Tri-State Mining Corp. at Linton, Ind.



Cutaway view of the TG-647 Allison Torqmatic transmission. It includes two full power take-offs (output) opposite each other. One output is for the wheels, the other for servicing equipment. They can be manually disconnected. A third power take-off which is directly opposite to input is available to drive other auxiliary equipment.

and quick-shift transmission be separate packages. So was born the Torqmatic converter and Torqmatic transmission.

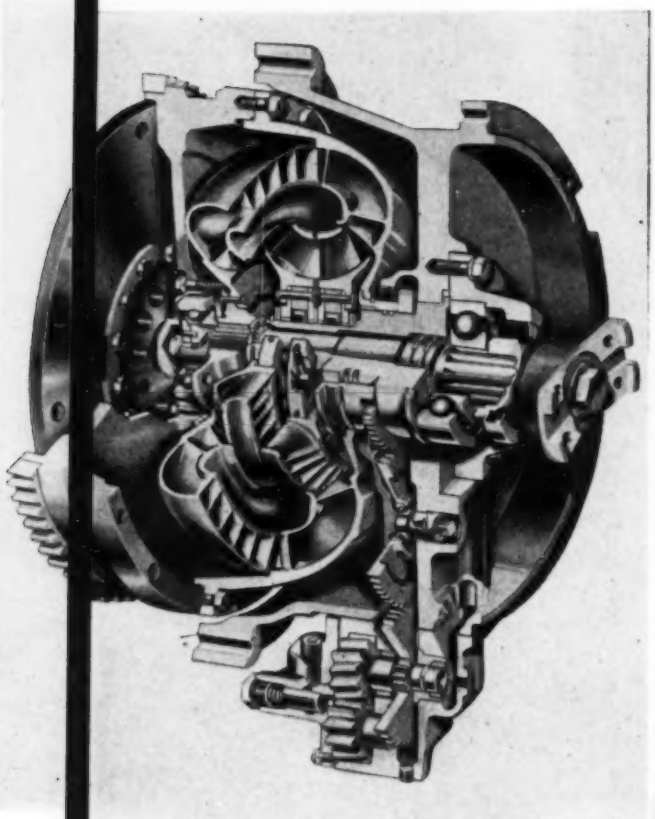
The Allison Torqmatic converter incorporates the rotary-housing principle for compactness and flexibility of installation. Its over-all length is the same as the conventional power take-off, and the weight is comparable. These converters are designed for operation in the 40 to 400 hp. range. The TC-200 series is a 3-element converter (pump, turbine and stator); the rest, TC-300, 400, 600, 800, and 900 series are 4-element converters (pump, turbine, two stators). All are polyphase, which means they operate as torque multipliers and as fluid couplings. Their maximum torque ratios range from 2.0 to 3.6 depending on the model.

The Torqmatic converter turbine is single stage, which means that the oil passes through its blading only once in one complete circuit through the converter elements. The stators are freewheeling —operating on the over-running clutch principle. The freewheeling stators are the key to the coupling features of the Torqmatic converter. The over-running clutch principle allows the stators to rotate when torque multiplication is no longer necessary. Also, the use of the freewheeling stators results in a smooth output horsepower curve by blending the transition points between the converter phase and coupling phase. The six series of Torqmatic converters offer a total of 135 models for a variety of application. The model variations include an integral cooler (200-300 series), a lock-up clutch in the converter and a hydraulic input disconnect clutch (400-600 and 800-900 series), a mechanical input or rear disconnect clutch, a governor drive on the output for tail shaft governors, and automotive flanges and industrial shafts.

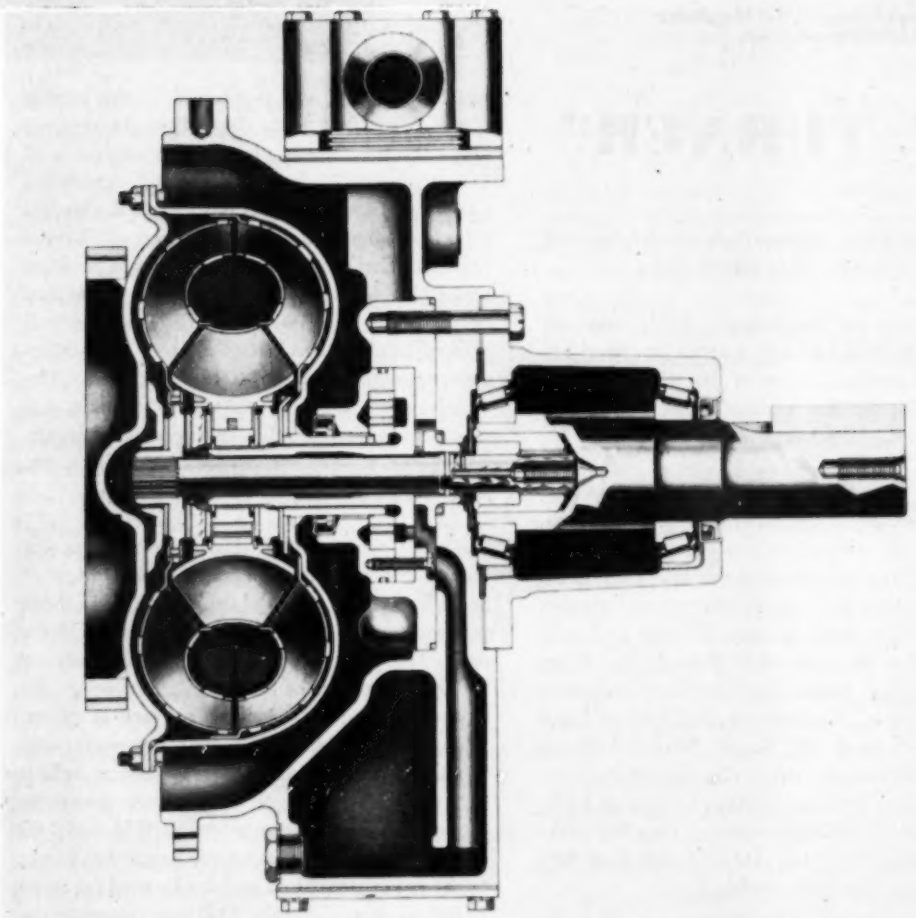
Many applications in which the torque ratios of the Torqmatic converters are sufficient can take advantage of the hydraulic torque multiplication and coupling feature of the Torqmatic converter without another transmission in the line. Such applications are: cranes, shovels, draglines and locomotives. In cranes the Torqmatic converter gives the operator perfect control to move the load up or down a fraction of an inch by simply moving the engine throttle. No clutching, declutching or friction braking is necessary to move the load. With friction clutches in cranes, it is often necessary to "slip" the clutch at full throttle in order to get heavy loads started. This practice, which often results in a burned or warped clutch and high maintenance costs, is entirely eliminated with Torqmatic converters. Other examples of Torqmatic converter applications are shovels, draglines, and backhoes. Engine speed will not fall off detrimentally because of momentary overload. The instant the bucket is slowed down by a load, torque multiplication increases automatically within the converter, enabling the operator to maintain a steady pace in moving the maximum amount of dirt that the unit is capable of handling. In addition, the converter protects the engine and equipment from the extreme shock loads which are common in this type of operation.

At all times, the Torqmatic converter permits the engine to operate at its most effective output, for the converter makes available more power over a wider working speed range, thus allowing more work to be done in a given length of time. Because of this, it is possible to use lower horsepower engines. For applications requiring higher range of torque ratios, Allison Torqmatic Drive offers the combination of a matched team (up to 16:1 torque ratio) designed to operate as a unit — the Torqmatic converters and the Torqmatic transmissions, which "quick-shift" at full torque at the flip of a finger. The selector valve hydraulically actuates friction clutches to engage the desired range. The Torqmatic transmission is unlike the conventional sliding gear transmission in that it has constant mesh planetary gearing which permits full torque shifting. This insures a smooth, uninterrupted flow of power from the engine to the load at all times.

The Torqmatic transmissions are designated as the TG-600 series, which come in three basic models from which over 70 variations can be obtained for various applications. These models vary from a straight through drive model, for installations not requiring accessory drive from the transmission, to models with countershaft drives, to front and rear drive lines with power take-off included. The many variations available include output flanges, right hand or left hand rotation, self-contained output-shaft disconnect



This cutaway view of the Allison model TC-654 converter shows its simplicity. It is a 4-element converter with integral charging oil pump.



The 200 Series Torqmatic is the latest addition to the hydraulic drives offered by Allison. It is a 3-element converter and completely self-contained.

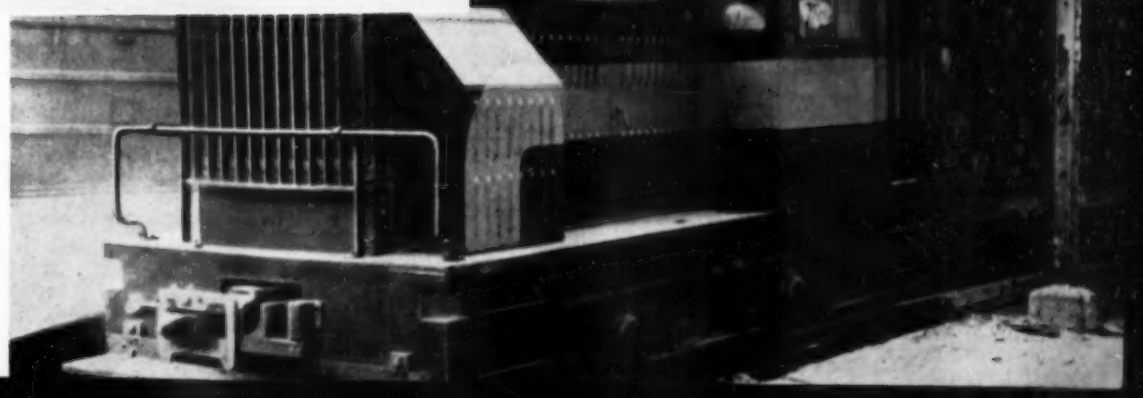
clutches, transfer gear ratios (.76:1 and 1:1), solenoid control range selector, with and without push-start pump, no-spin differential, and provision for mounting a Bendix brake hub. Two of the model variations developed for oil field mobile service are for processing pump units and servicing rigs. They permit the use of one transmission for "over the road *and* over the hole" operation. Built-in disconnect clutches make it possible to disconnect or connect power output to the drive axle or to the full power take-offs. The "oil field special" models are used in rotary drilling, acidizing, cementing and hydraulic fracturing operations. These Torqmatic transmissions were designed to meet the weight and space limitations of highway requirements and yet be rugged enough to do the heaviest of heavy-duty work. The quick-shift under full power, when pulling pipe out of the hole, has saved many hours of sweat and fears!

But the story of Torqmatic Drives does not end with the quick-shift transmission. Although the problem of faster, smoother, less costly load movement had been solved by Torqmatic Drives, one problem yet remained: How to speed up the job cycle time — particularly on down grade hauls. In most such operations the conventional friction brakes by their very construction and limitation have to hold the load to a crawl — and brake shoe replacement is high. Allison engineers came up with the answer, the Torqmatic brake. Integral with the converter, the Torqmatic brake is primarily for use in vehicles equipped with the Torqmatic transmission. This in-the-drive-line Torqmatic brake gives off-highway vehicles continuous braking power where most needed — on downhill hauls.

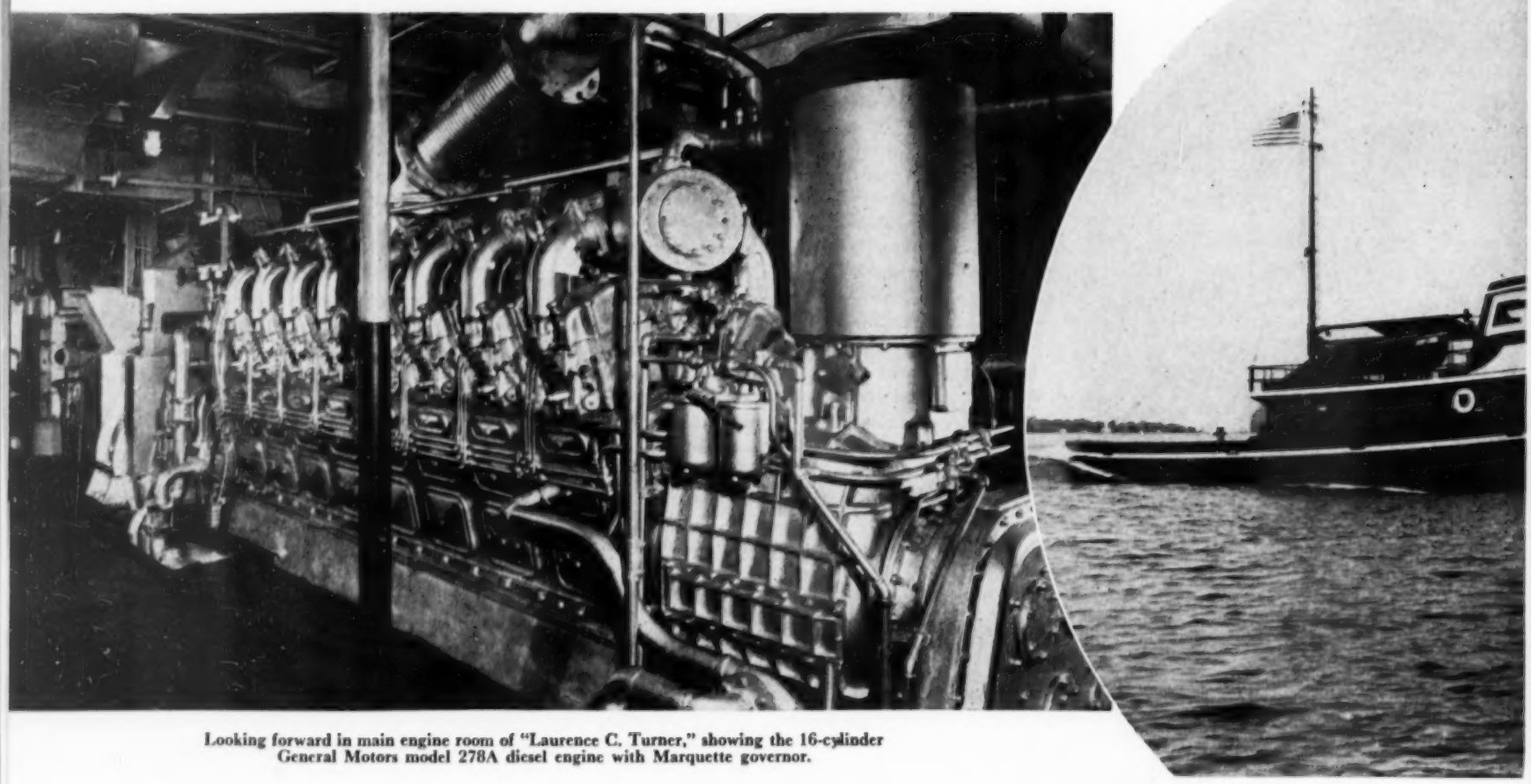
The driver has positive control at all times with the Torqmatic brake continuously applied going downhill with the heaviest loads. It saves the pedal brakes for complete stops or "snubbing" on curves. This dynamic brake, capable of absorbing approximately 400 bhp. depending on the operation, has only one moving part—rotor, or "paddle" wheel. The same oil that drives the vehicle brakes the vehicle.

When asked about the economic and operational contributions of Torqmatic Drive in the field of heavy-duty power transmissions, K. H. Hoffman, manager of transmissions operations of the Allison Division, replied, "Torqmatic Drive has made multiple engine installation practical. It has made possible greater engine power without excessively large transmissions and has obsoleted the conventional clutch. It has cut driver training time and reduced driver fatigue because the Torqmatic converter automatically balances the engine power to load demand, eliminating gear-shift guess and double-clutch pedal pumping. It has speeded the job cycle and increased equipment availability."

As the result of these advantages, drivers are quick to learn that they can do their work better and with greater ease than with mechanical transmissions. Many make their first question in an employment interview — "Is your truck a 'quick-shift job'?" Thus drivers and operators agree that Torqmatic Drives get the job done quicker—and better—with lower cost in dollars and human energy.



This 18-ton locomotive equipped with a hydraulic torque converter replaced two trolley-type locomotives for the Virginia Pulp and Paper Co. Smooth transmission power saves an average of $500 per month, the amount of coupler damage by older locomotives.

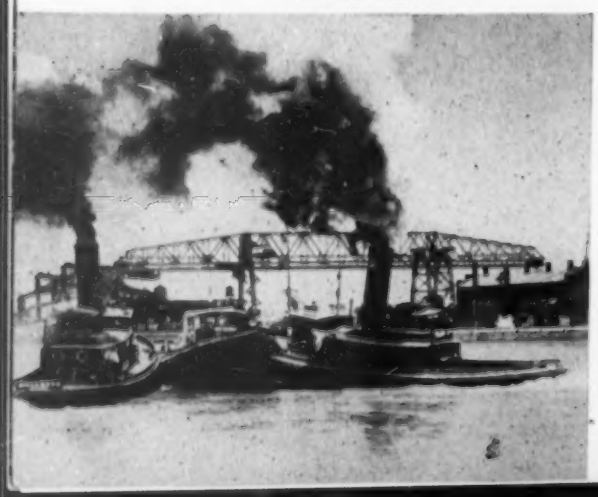


Looking forward in main engine room of "Laurence C. Turner," showing the 16-cylinder General Motors model 278A diesel engine with Marquette governor.

THE "LAURENCE C. TURNER"

IN 1949 the Great Lakes Towing Co. initiated a modernization program of its tugboat fleet. The recent delivery of the GM diesel-electric tug *Laurence C. Turner* marked the completion of the conversion of 25 of the Great Lakes Towing tugs from steam power to diesels. Twenty-three of the tugs were dismantled at the company's Cleveland yard. Of these, seven were completed there and 16, including the *Laurence C. Turner,* were towed to Paasch Marine Service Yard, Erie, Pa., for completion. Two were rebuilt at Defoe Shipyard, Bay City, Mich. According to Laurence C. Turner, president of the Great Lakes Towing Co., the complete repowering and rebuilding cost more than $5,000,000.

Increased power of tug fleet is demonstrated in this picture of the 1200 hp. diesel tug "North Dakota" at Conneaut Harbor, Ohio. She was lashed to the steam tugs "Minnesota" and "Kentucky," stem-to-stern, on either side. When all were working full ahead, the "North Dakota" pushed the steam tugs backward about one mile an hour.



In an article in the August, 1951, issue of DIESEL PROGRESS Mr. Turner described his company's modernization of its tug fleet and listed the factors that influenced the decision to switch to using diesel engines.

Since the first tug of the Great Lakes Towing Co. was placed in operation on Lake Erie in 1899, services offered by the company and its four subsidiaries have expanded its operation to the point where it now provides towing facilities over the entire chain of lakes. Harbor towing is performed in the ports of Buffalo, N. Y.; Erie, Pa.; Conneaut, Ashtabula, Fairport, Cleveland, Lorain, Huron, Sandusky and Toledo, Ohio; Detroit and Sault Ste. Marie, Mich.; Duluth, Minn.; Milwaukee, Wis.; Chicago and South Chicago, Ill.; Indiana Harbor, Gary and Buffington, Ind. In addition to harbor tugs, the company operates four tugs designed and equipped expressly for lake-wide towing.

Mr. Turner points out that the rebuilding program was undertaken "to provide, with economy of operation, the additional power, speed and maneuverability that it was anticipated would soon be required by the introduction of a number of large, powerful new ships on the lakes."

The *Laurence C. Turner,* formerly a city of Milwaukee fire tug, was purchased by the towing company in 1952. Only the hull of the original vessel remains. The tug has an over-all length of 118 ft., beam 24 ft., molded depth amidships 13 ft., 6 in., and the draft is 13 ft., 2 in. She has a fuel capacity of 20,000 gallons and will have a light running speed of 16 mph. and a cruising range of 4000 miles. The propulsion machinery of the vessel is a 16-cylinder, 2-cycle, General Motors model 278A diesel engine, with Marquette governor, rated 1740 hp. at 750 rpm. The diesel engine drives a 1090 kw., 525-volt, d.c. generator which supplies power to the propulsion motor. This motor, through reduction gears, turns the propeller at 198-248 shaft rpm.

With GM diesel-electric drive, maximum power is available under all operating conditions. Full and instantaneous control can be had from three positions: pilot house, engine room and after deck. The auxiliary equipment in the *Laurence C. Turner* consists of one 35 kw., 120-volt, belt-driven ship's service generator which is driven from the main propulsion generator shaft; one 4-cylinder model 71 GM diesel engine which drives a 40 kw., 120-volt ship's service generator set; and one 6-cylinder model 71 GM diesel 60 kw., 230-volt generator set for supplying power to the towing machines and can be used for overboard power and supply. This tug is rated by the American Bureau of Shipping as Class A-1.

Her decks and houses are entirely new, designed for efficiency of operation as well as the comfort and convenience of officers and crew. The tug is specially built for outside or over-lake towing and will carry a crew of 13. She is equipped with the latest navigational aids, including radio di-

Looking aft in the main engine room of the "Laurence C. Turner." Recent delivery of this tug marked completion of the conversion of 25 Great Lakes Towing Co. tugs from steam power to diesels.

rection finder, radar and radiotelephone. On the boat deck are placed the pilothouse, captain's quarters and an 18-passenger life boat. The after mast has a manual 5000-lb. double winch for raising and lowering the life boat and for general hoisting. On the main deck are the quarters for the officers, engineers, crew and the galley. The galley is finished in stainless steel and has a seating capacity for eight. Forward on the main deck is one 1000-lb. housed-in anchor with an air-driven windlass and capstan. Immediately aft of the cabin on the main deck are the pawl posts and towing bitts and a fully automatic electric towing machine with 1800 ft. of 1¾-in. plow steel wire. Mr. Turner describes this tug as being "in all respects the finest tug of the Great Lakes Towing Co. fleet."

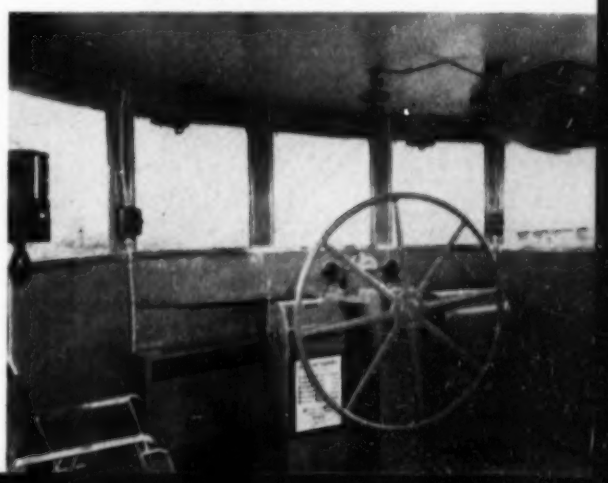
The first tugs converted to diesel were powered with GM diesel-gear drive and placed in operation in 1949, and the first tug equipped with GM diesel-electric drive in June, 1950. A number of factors influenced the decision to use diesel engines in these tugs. First, the use of water-tube boilers was considered undesirable because of the polluted and muddy waters of the rivers and harbors. The size of the tug was such that it was not feasible to install a suitable steam plant to produce more than 800 hp. The space available would not permit the necessary auxiliaries. It was believed that diesels would produce the necessary extra speed and power with greater efficiency and lower fuel costs compared to the old coal-fired steam equipment. The diesels would eliminate the smoke and make available pilothouse control of engines, an important advantage. Other considerations were the fact that the 2-day fuel cycle of the steam tugs would be expanded to 30 days, that there would be no loss of service for boiler washing and that the power plant could be shut down when the tug was not in use, resuming operation immediately as compared to four hours required by steam tugs to get under way again. Power would not only be greater, but more constant. This constant availability of greater power is of real importance in assisting the Great Lakes fleet in moving the maximum volume of tonnage.

The service for which the tug was intended determined in each case the type of drive used. In some of the ports where conditions demand the maximum of flexibility and maneuverability in tug operations, the diesel-electric drive demonstrated extraordinary efficiency. In other ports, the diesel-gear drive has been completely satisfactory. The *Laurence C. Turner* and some of the other larger tugs of the fleet have been designed for use in outside towing and equipped with every accommodation for the crew. Harbor tugs are operated by three crews of four men in 8-hour shifts, plus relief crews substituting when regular crews have days off. No living facilities are provided on these tugs.

The operating crews of the tugs have welcomed the conversion with enthusiasm. Approximately 100 engineers and oilers have attended the training school operated by the service department of the Cleveland Diesel Engine Division of General Motors. It is interesting to note that the ages of the engineers who have completed this course and are satisfactorily operating on the diesel tugs range up to 75 years, which indicates that even "dyed-in-the-wool" steam men are interested in learning about dieselization. The repowered tugs are handling vessels with greater speed and efficiency than when they were powered with steam and, in addition, have proved more suitable in icebreaking operations which mark the opening and closing of every Great Lakes navigation season. Their increased power was graphically demonstrated in a test made at Conneaut Harbor, Ohio, when the 1200-hp. diesel tug *North Dakota* was lashed to the steam tugs *Minnesota* and *Kentucky*, stem-to-stern on either side of her. When all tugs were working full ahead, the *North Dakota* pushed the steam tugs backwards about one mile per hour.

The modernization program has produced all of the desired results and the operation is particularly benefiting from the increased speed, power, efficiency, maneuverability and economy of the tugs which are now in operation. The conversions have placed this company in position to make a greater contribution to the magnificent efforts of the Great Lakes shipping industry.

Pilot house view. Dual control stands at either side of the steering wheel give the pilot instant fingertip control of the engine at all times.



VISCOSITY CONTROL OF HEAVY FUEL

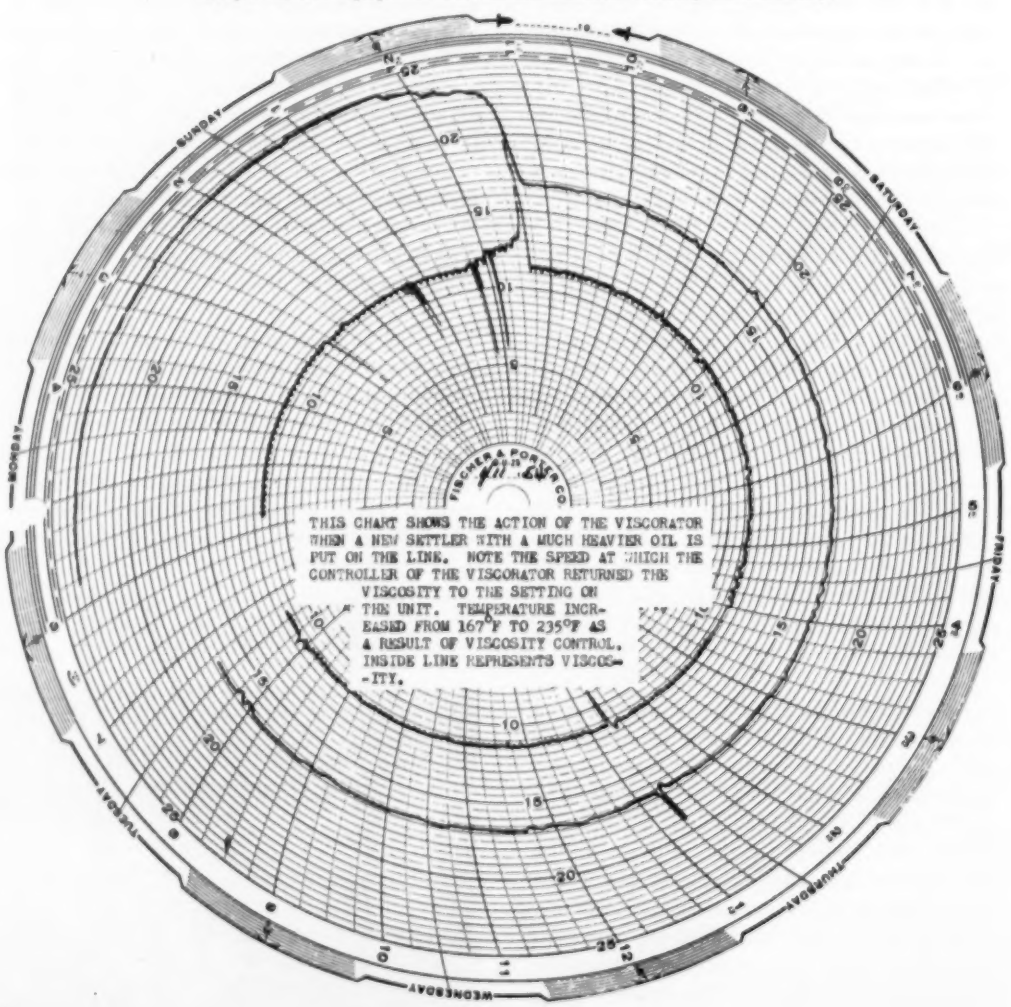
COMPETITION and high cost of diesel oil today make the use of heavy oil a "must" aboard motor vessels. Heavy oil in the Western Hemisphere is known as Bunker C, and any discussion of Bunker C should include a short review of the sources of supply and the quality of the product. The results of operating with light oil are well known. However, when Bunker C is used, it must be realized that there is no control by the oil refineries to any particular specification. A very wide range specification is necessary because of the various types of crudes and refinery practices in different sections of the world. In addition, the price of Bunker C does not allow for any control to a narrow range.

In America, for instance, Bunker C runs to very high viscosities, whereas in most of the Near East it runs to extremely low viscosities. As Europe obtains the greater part of its oil supply from the Near East, experience on the continent is based on low viscosity Bunker C. This frequently has caused considerable misunderstanding and improper control aboard ship when high viscosity bunkers are picked up in the Western Hemisphere by ships normally operating in the European and Far East area. Many motor vessels which have supposedly been converted over in Europe to burn Bunker C cannot handle this product as it is available in America. Much time, money and difficulty can be eliminated if consulting engineers, shipyards and owners in Europe will acquaint themselves with the grades of Bunker C available throughout the world and the variation which can be expected.

With Bunker C from many sources of supply, fuel oil temperatures from 150°F. (65.5°C.) to 250°F. (121°C.) are frequently required to maintain the desired viscosity for proper operation of the main engine aboard ship. With such temperatures the fuel oil system must be pressurized by the installation of a fuel oil pump before the last fuel oil heater (as illustrated by diagram 1). This is essential to prevent vapor binding of the fuel injection pumps. In a number of cases it has been found that the fuel pump (booster pump) is installed after the last fuel oil heater. This has resulted in vapor binding of the fuel pump and, of course, the fuel injection pumps as well (see diagram 2).

It is also important to assure sufficient capacity of the last fuel oil heater and a constant steam supply of uniform pressure. It is usual for steam to be supplied to the fuel oil heater from the waste heat boiler. The additional demand on the boiler to supply the heater(s) when Bunker C oil is used frequently overloads the boiler when auxiliaries are placed in operation. Under such overload the boiler pressure drops, and at the lower pressure, the fuel oil cannot be maintained at the required temperature to assure a uniform viscosity. To correct the condition, a waste heat boiler of sufficient capacity must be installed or the oil fired boiler must be placed on the line to maintain the required steam pressure continuously. In addition, it is essential in all cases, but especially aboard motor vessels, to maintain the correct fuel oil viscosity continuously. Up to very recently, no definite method was available to control the heating of fuel oil by viscosity. However, E. F. Drew & Co., Inc., now has available its Viscorator, which maintains oil at constant viscosity automatically.

This Viscorator chart shows results of actual operation aboard a steam supertanker and illustrates fluctuation in temperature which actually took place when using Bunker C as it is available in Western Hemisphere. Inside line represents viscosity and outside line represents temperature. When using Bunker C such variations in oil can be expected. Proper control equipment will maintain desired viscosity automatically.


SUNDAY
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
FISCHER & PORTER CO.
THIS CHART SHOWS THE ACTION OF THE VISCORATOR WHEN A NEW SETTLER WITH A MUCH HEAVIER OIL IS PUT ON THE LINE. NOTE THE SPEED AT WHICH THE CONTROLLER OF THE VISCORATOR RETURNED THE VISCOSITY TO THE SETTING ON THE UNIT. TEMPERATURE INCREASED FROM 167°F TO 235°F AS A RESULT OF VISCOSITY CONTROL. INSIDE LINE REPRESENTS VISCOSITY.

The Drew Viscorator, which is designed to measure the viscosity of Bunker C continuously, can be set to maintain any desired viscosity between 40 SSU and 200 SSU at the injectors. Control to the desired viscosity setting is by means of a special controller which is directly connected to the viscosity measuring device in the Viscorator. In turn, the controller maintains the correct steam flow by means of compressed air to a pneumatic steam valve in the steam line to the heater(s). In this way steam is supplied to the heater so as to maintain a constant viscosity on the oil. As oils vary in specifications, the temperature of the oil changes to maintain the set viscosity. This is quite different from controlling the temperature of the oil with a temperature control valve, in which case the temperature of the oil remains constant. When controlling fuel oil by temperature, it is necessary, after each barge delivery, to manually adjust the temperature control valve to a new temperature in an effort to obtain the desired viscosity on the oil. Experience to date with temperature control suggests that a good guessing game has been carried on for years, as it is most difficult to determine the correct temperature for each grade of oil delivered to the vessel. When two or more oils are mixed in the tank or tanks, control by temperature has little meaning. When controlling by temperature, the temperature remains constant, and as oils vary in specifications the viscosity of the oil changes. As all equipment manufacturers specify fuel oil in viscosity for proper atomization by their

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and
C. E. MASON, JR.*

equipment, control of fuel oil by viscosity appears to be the only answer.

A number of Viscorator installations have been operating satisfactorily for two to three years aboard steamships and improvement in cleanliness of boiler firesides, due to viscosity control, is very gratifying. This includes cargo ships such as C-2, C-3 and P-2, and tanker types T-2, T-3 and supertankers. More recent installations aboard motor vessels are demonstrating the importance of viscosity control and are bringing to light the need for proper installation of pumping and heating equipment when using Bunker C aboard vessels of this type. It has been found, for instance, that in a gravity feed system where the fuel oil gravitates from the day tank to the fuel oil heater and thence to a booster pump and/or the main injection pumps, only a light oil such as Bunker B (#5 oil) can be used. However, these oils demand a premium price and are not always available when needed. Unrestricted grades of Bunker C fuel oil frequently require temperatures considerably greater than 200°F. to reduce them to the proper viscosity. These high temperatures will cause the booster pump and/or main injection pumps to vapor bind. However, when the fuel system is pressurized and the booster pump is placed before the fuel oil heater, all vapor binding will be overcome and any grade of Bunker C can be used as long as the capacity of the fuel pumps, fuel oil heaters and steam supply is adequate.

With control by the Drew Viscorator, it is only necessary to determine the viscosity which is most satisfactory for operation of the main engine. Once this viscosity is determined, the Viscorator is continually maintained at this setting and all oils bunkered are automatically controlled to this viscosity regardless of oil specifications or the mixing of two or more oils. Another distinct advantage of Viscorator operation is the pen recording on a 24-hour chart of both viscosity and temperature. Even though oil temperatures are no longer important, they are recorded on the chart for their interest value and to check on heater operation and steam supply.

A review of the Viscorator chart illustrated, showing results of actual operation aboard a steam supertanker, is of real interest. This chart illustrates the fluctuation in temperature which actually took place when using Bunker C as it is available in the Western Hemisphere. The inside line on the chart represents viscosity and the outside line represents temperature. When using Bunker C oil, such variations in the oil must be expected and proper control equipment installed to maintain the desired viscosity.

When heavy oils are used without close viscosity control, it is not unusual for the repair and replacement costs to more than offset the savings in burning the lower priced Bunker C oil. On one vessel using heavy oil without close viscosity control, the wear on the cylinder liners was so great that all eight required replacement in approximately six months of operation. In addition, all piston rings were broken, pistons were extremely dirty and exhaust ports were plugged. It was necessary to stop at sea to open the cylinders and remove deposits from the exhaust ports. A Viscorator has now been installed aboard this vessel and a number of other motor vessels with various makes of engines. The improvement in the operation is substantial and repair and replacement costs appear to be in line with light oil operation. When the Viscorator is initially installed, and a recommended viscosity by the engine manufacturer is not specified, the correct viscosity setting can be determined by setting the instrument to the lowest viscosity during sea operation and then raising the viscosity by 10 SSU at the end of every two hours until the correct viscosity is determined.

When the viscosity is increased sufficiently to cause the engine to smoke, the viscosity is lowered by 15 SSU to obtain smoke-free operation. This provides correct engine operation at the highest satisfactory viscosity with the lowest operating temperatures for the fuel oil. Once this viscosity is obtained, the Viscorator remains at this setting, with no further changes. From then on, all oils taken on board will be closely controlled to the viscosity at which the Viscorator is set. This will be so, even though two or more oils are mixed in the same tank. Of course, it must be understood that the fuel oil heaters and the source of steam supply will be of sufficient capacity to meet the requirements of each installation. Experience to date with viscosity control of fuel oil suggests that Bunker C can be used aboard all sea-going motor vessels with results that appear as good as with light oil.

Substantial savings in the cost of the heavy oil vs. light oil are not offset by higher repair and replacement costs.

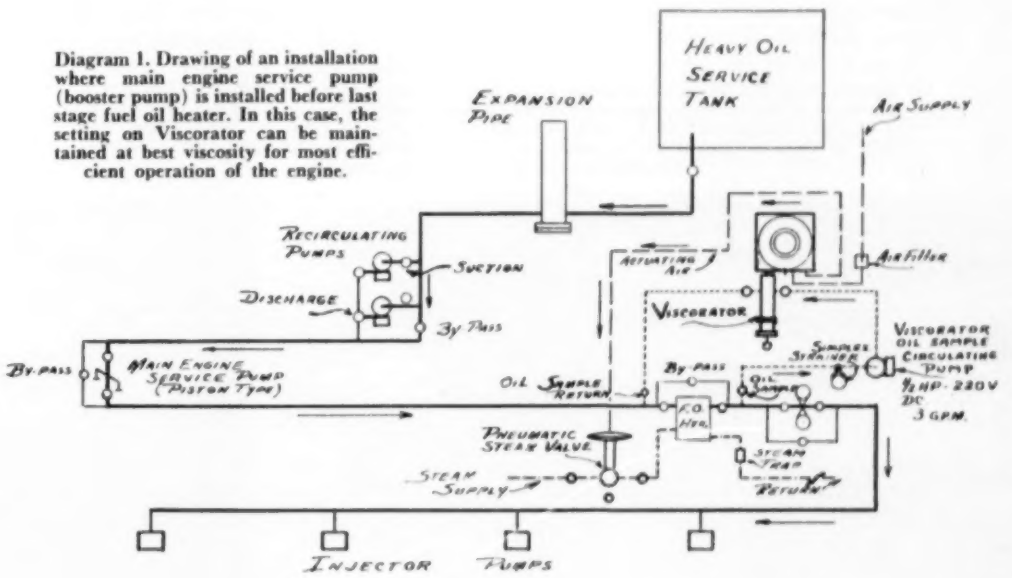


Diagram 1. Drawing of an installation where main engine service pump (booster pump) is installed before last stage fuel oil heater. In this case, the setting on Viscorator can be maintained at best viscosity for most efficient operation of the engine.

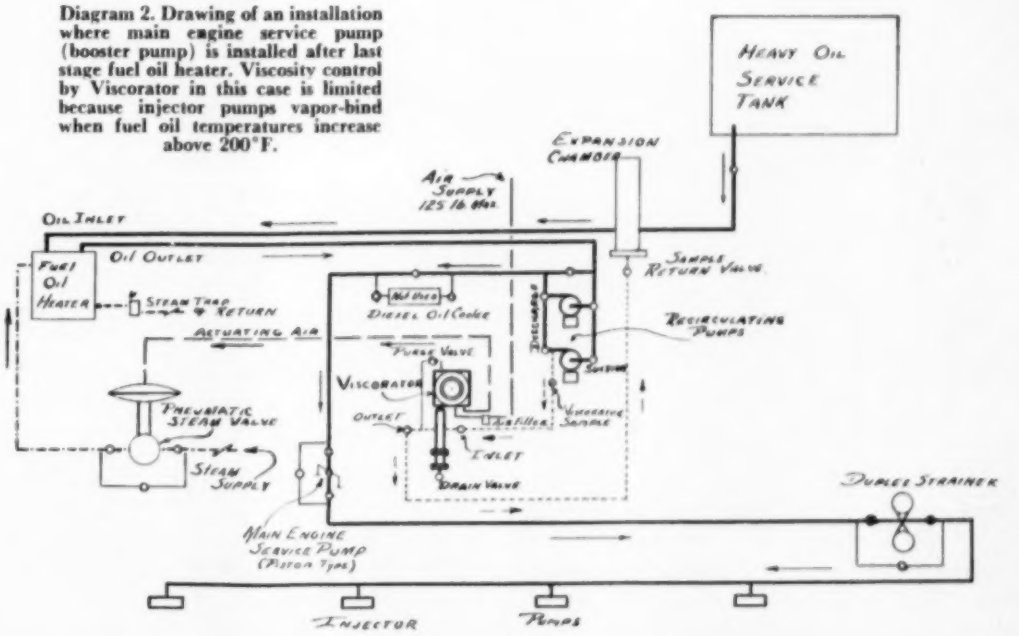


Diagram 2. Drawing of an installation where main engine service pump (booster pump) is installed after last stage fuel oil heater. Viscosity control by Viscorator in this case is limited because injector pumps vapor-bind when fuel oil temperatures increase above 200°F.

*Mr. Ulrich is manager of the Marine Division, E. F. Drew & Co., Inc., and Mr. Mason is head of the division's Viscorator Installation and Service Department.

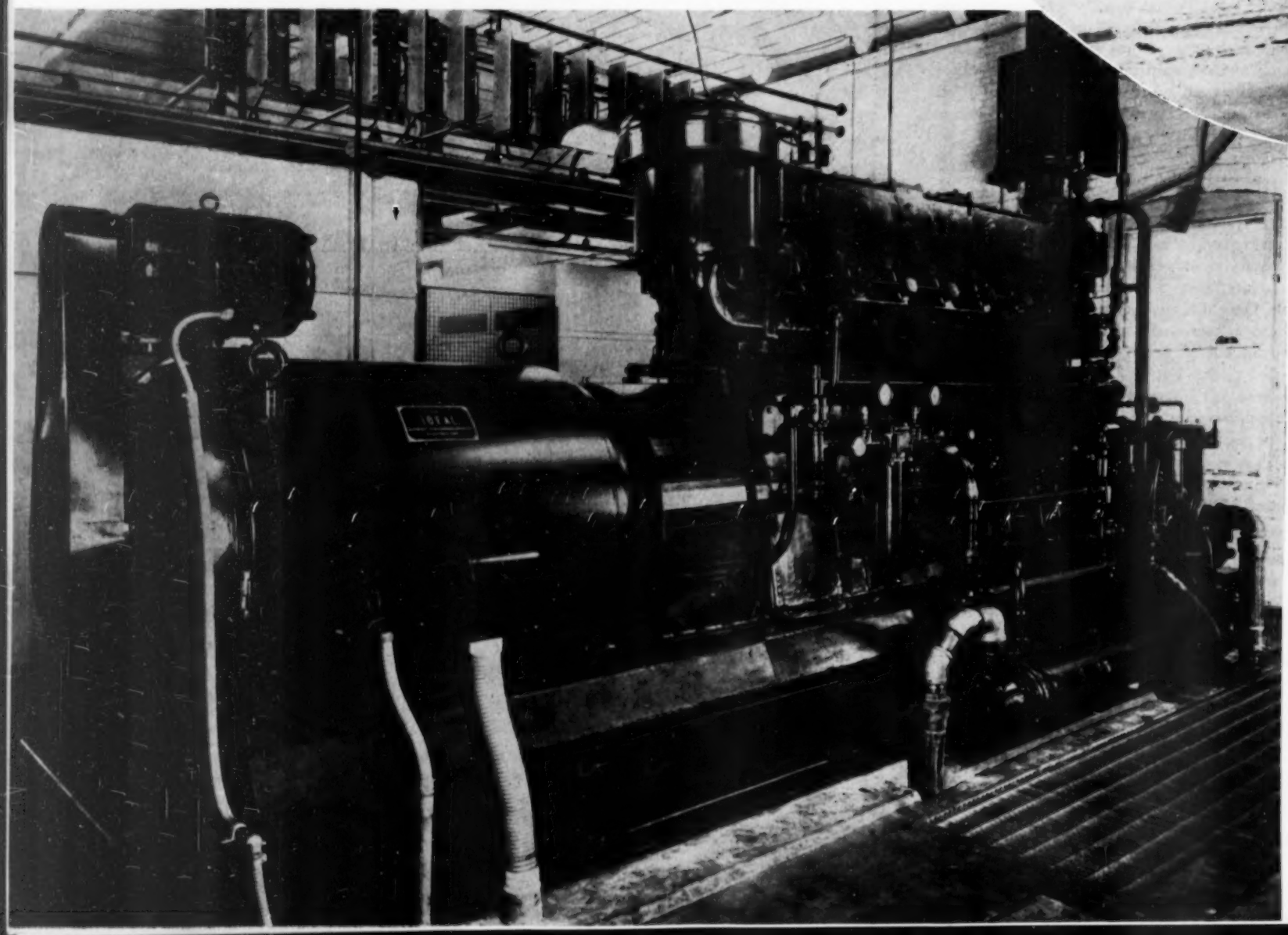
A CIVIL DEFENSE INSTALLATION

ATTLEBORO, MASS.

COMPLETE independence of nearly 50-year-old steam pumps for water supply was achieved by the city of Attleboro, Mass., recently when a diesel engine powered generator was installed for stand-by power at the water works. An engine of 435-hp. driving a 300-kw. generator gives ample power for all pumps during occasional periods of failure of utility line power, which is used normally for pumping. Normal water requirements of the city's 24,000 people, including fire protection, are assured without interruption.

Russell P. Tennant, Superintendent of Public Works, Attleboro, is convinced that "It's naive to believe that stand-by is something you'll need for just an hour tomorrow or 10 minutes next week. We need something that will stay in there and 'deliver.' You never know how long you are going to be without power." Five or six power interruptions usually occur each year. For these reasons a heavy-duty diesel engine was specified to assure a continuous supply of water for long periods of time. The stand-by power unit comprises an 8-cylinder Superior model 40-S-8 diesel operating at 900 rpm. and driving an Ideal generator. In the event of failure of outside lines supplying power, the engine is started manually and put into service by the operator on duty. After it is brought up to speed, the main water pumps are put into operation. In addition to the pumps this stand-by power operates engine accessories and provides for building lighting.

Of more than passing interest are the Water Department's provisions against transmission of vibration to station piping in the ground. This includes 14-in. and 16-in. cast iron pipe with several large fittings in the discharge line. The foundation on which the engine rests is separated from the surrounding floor by sponge rubber sheets ½-in. thick, cemented to the sides of the foundation. More unusual is the fact that the engine is not bolted to the foundation but rests on 54 vibration snubbers spaced equally under the engine bed. These snubbers consist of inch-thick solid rubber pads bonded



Standby power for pumps in Attleboro Water Works consists of a 300 kw. Ideal generator driven by a 435-hp. heavy-duty Superior diesel engine supplied by National Supply Co. Accessories include fuel oil day tank mounted on wall above and left of window, Hilco lube oil filter in front of the window and Air-Maze oil bath type air filter above the coupling between engine and generator.

between two 6-in. by 8-in. steel plates. The engine operates almost without any vibration.

Major pumping equipment comprises two motor-driven pumps which deliver the city's daily requirements of 3,500,000 gallons of water into 106 miles of mains and to a standpipe reserve under a 253-ft. head. This is equivalent to approximately 1200 gallons per minute per pump at 115 lb. per sq. in. Standpipe capacity is 1,500,000 gallons. Four electric pumps, one at each of four gravel-packed wells near the city's main station, are also operated on power supplied by the stand-by unit.

Attleboro gets its water from three sources. These are the four wells near the pumping station, an intake station on Lake Mininuchi, head-waters of the Wading river and the Seven Mile river at the main station. The Wading river was found inadequate for the complete needs of the city but the semi-automatic intake station has been retained there. It sends its water about six miles through an 18-in. main and enters directly into the northerly end of the city system. The Seven Mile river supply filters through the brick-walled filter houses and is electrically pumped to the aeration and lime tanks. Water pumped in from the four wells meets the system here also. Water is supplied to the system from the aeration tank. Automatic or manual control is provided to draw from the wells or from the No. 1 filter house as the level in the aeration tank falls.

The stand-by engine is assured of adequate starting fuel oil by a 15-gallon wall-mounted day tank in the engine room. Air starting tanks are kept in readiness by an air compressor with motor and air cooled engine.

List of Equipment

Engine—Model 40-S-8, 435 hp. at 900 rpm., Superior. National Supply Co.
Generator—3-phase / 60-cycle / 2400 volt, 900 rpm. Ideal Electric.
Engine time meter—Westinghouse Electric.
Water jacket heat exchanger—Kewanee-Ross.
Switchboard—Ideal Electric.
Water jacket pump regulator—Amot Controls.
Lube oil temperature regulator—Amot Controls.
Lube oil cooler—Kewanee Ross.
Exhaust silencer—Maxim.
Flexible 6-in. metal hose—Flexonics.
Air intake filter silencer—Air-Maze.
Air compressor—Quincy.
Lube oil filter—Hilliard (Hilco).
Vibration dampening pads—Manhattan Raybestos.

Attleboro Water Works is beside Seven Mile river. Fuel oil for standby diesel is stored in a 5000-gallon tank at far left. Building behind smokestack houses aeration and purifying equipment.

Control side of Attleboro's 435-hp. Superior standby diesel shows Woodward governor and Hilco lube oil filter. Steam boilers, now used only for building heat, are behind engine. Flexible exhaust connections by Flexonics.

WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.

BRITISH AERO ENGINE DEVELOPMENTS

THE annual exhibition and flying display staged by the Society of British Aircraft Constructors was held in September at the Royal Aircraft Establishment, Farnborough. It was generally considered to be the best show yet, and on the final day the attendance exceeded 160,000. The rapid development of gas turbine engines is illustrated by the following figures for the number of aircraft engines on show:

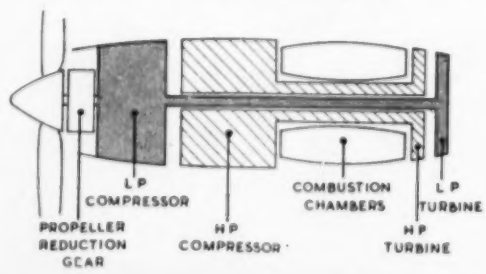
	1946	1954
Piston Engines	43	21
Turbojets	5	34
Turboprops	....	8
Composite Diesel/Turboprops	....	1

Nearly all the latest aircraft, both for the services and for commercial purposes, were displayed in flight. Notable among these were the Comets II and III, the Bristol Britannia, the Viscount, the Vulcan and Victor bombers, the latest Canberras and the Folland Midge which is the prototype of a small fighter designed for operation at super-sonic speeds. From the engine aspect, there were three in particular deserving of mention due to their novelty. (Napier's "Nomad" and "Eland" engines have already been described in previous issues of DIESEL PROGRESS.)

BRISTOL B.E. 25. This entirely new engine, developed by the Bristol Aeroplane Co., Ltd., Filton, Bristol, is described by the makers as the world's first supercharged turboprop and it is being developed for the transport aircraft of the future. It is claimed that the B.E. 25 combines the advantages of the best existing turboprop engines with those of the latest type of straight jet—the twin spool as exemplified in the "Olympic" engine. These are the working principles of the supercharged turboprop. The high-pressure compressor and the combustion chambers and high-pressure turbine can be considered as the "boiler" or gas-producing parts of the engine. This provides a stream of high-velocity, high-temperature gas which drives the low-pressure turbine, which is linked by a shaft to the low-pressure compressor which supercharges the high-pressure compressor and also drives the reduction gear and propeller.

An important feature of the engine is that there is no mechanical coupling between the HP compressor/turbine system and the LP compressor/turbine system. They are connected only by the gas stream. This makes it possible to operate the "boiler" section of the engine at its best efficiency while at the same time the propeller can be operated at its maximum efficiency. Normally, any engine will lose power as altitude increases and density and temperature fall off. The supercharged turboprop, however, has a reserve of power which results in constant output, whatever the "local" conditions. The B.E. 25 has been developed by making use of the best design features of other engines in the Bristol family, in particular the "free-turbine" of the Proteus and the "twin-spool" of the Olympus.

Diagram illustrates the principle of supercharged turboprop, latest development of the gas turbine engine to be produced by British engineers.



Britannia airliners on main assembly line of Bristol Aeroplane Co.'s Filton works, said to be the world's largest.

ROLLS-ROYCE "SOAR." This is a very small, lightweight, axial-flow turbojet engine. It is only 15¾ in. in diameter, 62¾ in. long, and weighs only 267 lb. Rated at 1810 lb. thrust, it has passed a type test at 1861 lb. thrust, giving a power/weight ratio exceeding 7:1. For experimental purposes, two of these engines were fitted at the wing tips of a Meteor aircraft in addition to the normal twin jet engines.

HELICOPTER PROJECT—P.74. The P.74 is the prototype of a twin-engined, single-rotor helicopter with accommodation for a crew of two and eight passengers or an equivalent freight load. The crew is seated side by side in the nose of the fuselage, in front of the passenger cabin which is divided into two parts with four seats in each part. Two Napier "Oryx" turbo-gas generators form the power unit and these are situated side by side beneath the floor of the forward half of the cabin. The gas produced by these units is fed by means of vertical ducting on each side of the fuselage between the two cabin compartments and converging above the cabin to pass through the hollow rotor head into each blade, discharging through nozzles at the tips.

An auxiliary gearbox, driven from the rotor shaft, provides electrical and other services, including on the prototype the drive for a small tail rotor. In each gas duct there is a valve controlled from the cockpit, the operation of which, by diverting the gas streams through vents in the fuselage, enables the power units to be run at full power on the ground.

DIESEL TANKER "V. L. KEEGAN II"

Moving slowly up New York's East River, the "V. L. Keegan II" is seen against Brooklyn skyline. She can carry upwards of 300,000 gals. of oil or gasoline at a draft of only eight ft.

SPECIFICALLY designed to carry a maximum amount of oil at a minimum draft through the shoal waters of Fire Island inlet and Great South Bay, the 199-ft. motor tanker *V. L. Keegan II* is currently carrying as much in one trip through the waters surrounding New York and Long Island as can ordinarily be carried in two trips by competing vessels of the same size. Having an unusually wide beam of 42 ft. and a bottom which is as flat as efficient stripping-out provisions would allow, the *Keegan* can transport upwards of 300,000 gallons of gasoline or diesel oil at a draft of only 8 ft., or 11,000 barrels at a draft of only 10½ ft.

The *V. L. Keegan II* was designed and built by Ira S. Bushey & Sons, Inc., Brooklyn, N. Y., for operation along the northern Atlantic seaboard from Maryland to Canada by Spentonbush Fuel Transport Service, Inc., New York. She is powered by two model 38D8⅛ Fairbanks-Morse opposed-piston marine diesel engines, each rated at 640 hp., and has a speed of 12 knots while running light. The extremely compact design of these engines, particularly their shorter length, enables the *Keegan's* engine room space to be kept at a minimum, thus reducing weight and increasing her cargo-carrying capacity. Of all-welded steel construction, the motor tanker is longitudinally framed and has a molded depth of 12 ft. at the side. She has twin screws and rudders and can maneuver in the tightest spaces without the aid of tugs. In the 18 weeks following her entry into service Nov. 12, 1953, the vessel carried a total of 22,756,026 gallons of gasoline and diesel oil in 106 complete round trips, representing an average of almost one trip a day and 214,679 gallons per trip. Her two 1150-gpm., engine-driven cargo pumps can unload her completely in less than three hours.

Despite this heavy schedule, during which the two Fairbanks-Morse engines ran for 1250 hours, the *Keegan* never had a forced lay-up of any kind. Fuel consumption was extremely low, according to Hans Leirvik, chief engineer, averaging about 45 gallons per hour for both engines combined. In designing the new vessel, there were two main problems to be solved. First, the vessel had to be designed shallow enough draft to navigate the shoal waters of Fire Island inlet, Great South Bay, the Hackensack River and other connecting waterways in and around New York harbor. Second, the vessel had to have a high degree of maneuverability, capable of operating in close quarters.

To meet the two specifications of draft and maneuverability, the design limited the depth of the vessel to 12 ft. with a resulting length of 199 ft., 6 in. Then, to allow for maximum capacity, the beam was expanded to 42 ft., unusually wide for a vessel of her length, and limited the dead rise to a bare minimum, just enough to provide for good stripping out during cargo unloading. One of the features of the *V. L. Keegan II* is her electro-mechanical steering system, especially well suited to a vessel with twin rudders. Still another feature, and one which has worked out well and which perhaps makes her unique in the New York area, is a double set of remote engine controls installed in her pilothouse and engine room, permitting instantaneous engine control from either station, despite the fact that the two Fairbanks-Morse O-P engines are direct reversing. Though more common on the Mississippi River system, this type of remote control, installed on a vessel of the *Keegan's* size, with

General view of port and starboard main engines. Equipped with 63:32 F-M reduction gears, these 4-cylinder Fairbanks-Morse opposed-piston engines consumed an average of only 45 gallons of fuel per hour in first 1250 hours of continuous operation.

direct-reversing engines and twin screws, is perhaps the only installation of its kind on the Atlantic seaboard.

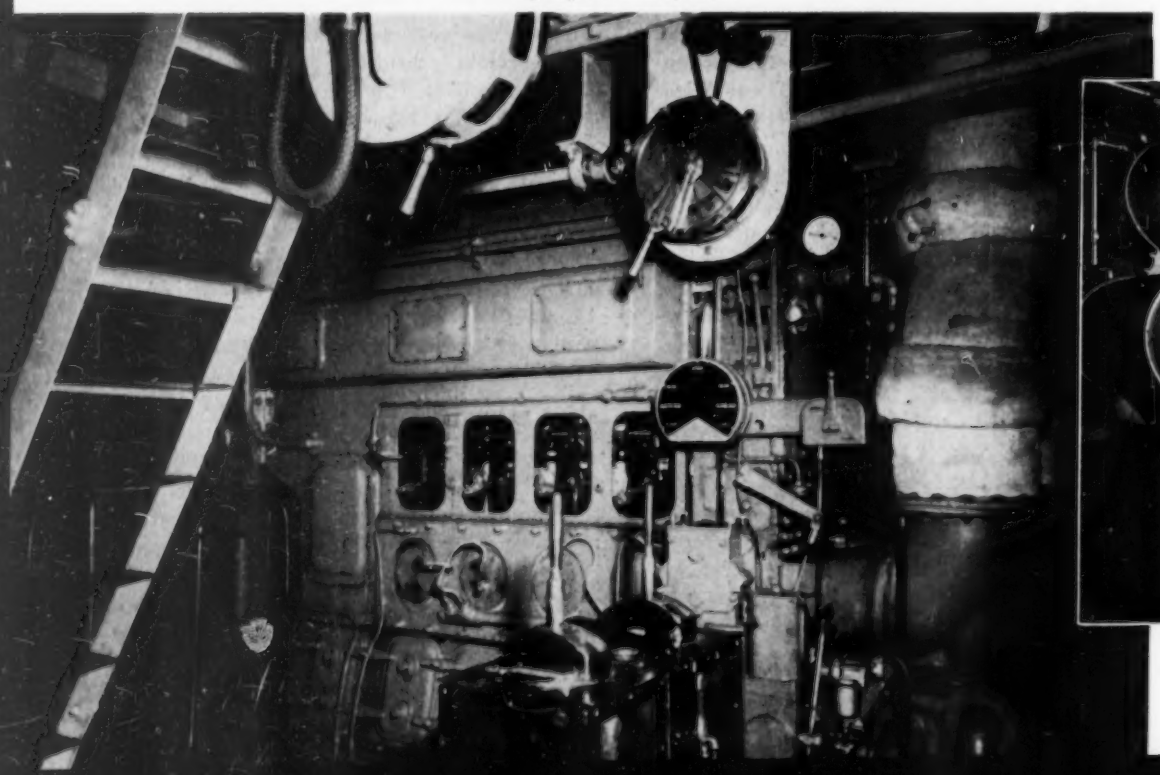
The vessel has a fuel capacity of 8000 gallons. Stored in two steel bunkers of equal capacity, the fuel is picked up by the engines through individual supply pumps, sent first to a 60-gallon day tank and then through duplex filters to the diesel injection pumps. The overflow from the day tank is returned to the bunkers through a spring-loaded by-pass valve. The two Fairbanks-Morse engines were chosen because of their light weight, heavy-duty construction, their short length, which permitted the size of the engine room to be kept to a minimum, and on the basis of the yard's past experience with the O-P. They are 2-cycle units, each developing its rated 640 hp. at a speed of 720 rpm. and each having four cylinders of 8⅛-in. bore and 10-in. stroke. They drive twin 3-bladed propellers of 72-in. diameter and 40-in. pitch through reduction gears of 1.97 : 1 ratio and through a shaft equipped with Cutless rubber inboard and outboard bearings.

Lube oil for the two O-Ps is stored in two separate tanks, one with a capacity of 200 and the other with a capacity of 400 gallons. It is circulated under pressure in each engine by means of a positive, gear-type pump, which is driven off the lower crankshaft and which directs the lube to all cylinders and bearings. Included in each lube system are a full-flow strainer and oil cooler. For further purification, a predetermined amount of lube is by-passed continuously from the system through two cartridge-type, cellulose-packed filters. For prelubrication of the engines before starting, a cross-connected standby pump, driven by a 10-hp. motor, is provided for both units. Jacket water is circulated through each engine in a closed system by means of two centrifugal fresh water pumps, each having a 3-in. suction and 2-in. discharge and each driven by a 5-hp. electric motor. Before being returned to the engine, the water is cooled in separate heat exchangers, automatic, thermostatically-controlled by-pass valves keeping it within the desired temperature range.

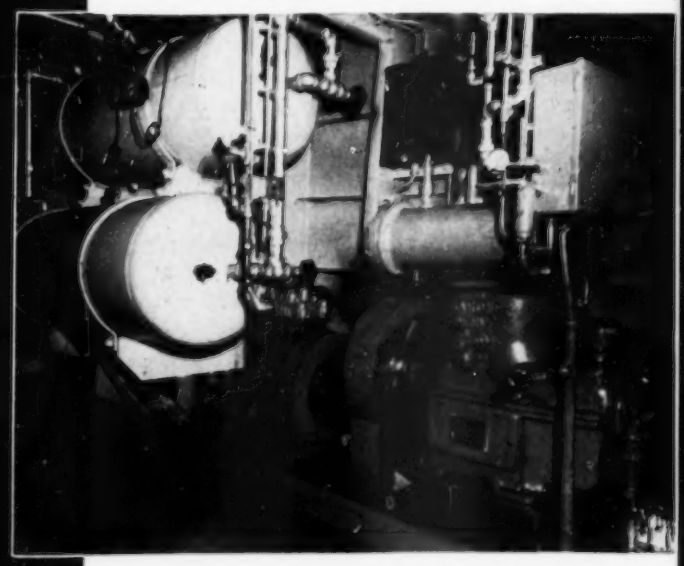
From the heat exchangers, the fresh jacket water flows directly to the lube coolers. In this way contamination of the lube oil due to salt-water leakage is avoided, raw sea water being used as a coolant only in the heat exchangers. Two similar motor-driven pumps are provided for the raw-water circuits. Starting air for the two O-Ps is drawn from the vessel's 250 psi. compressed air system, consisting of four 30-in. by 96-in. air tanks and two motor-driven air compressors, one driven by a 10-hp., 1750 rpm. electric motor and the other, used as a standby, by a 3-hp., 1750 rpm. motor. Scavenging air is drawn from the outside through an oil-bath type filter-silencer on the poop deck and is sent to the cylinders under pressure by means of a positive-displacement type blower, driven through a flexible gear drive off the upper crankshaft. Exhaust gases are expelled through a vertical silencer and through a rounded stack mounted on the poop deck immediately aft of the pilothouse.

The temperature of the exhaust gases is recorded by a multi-point exhaust pyrometer, mounted on each engine's individual gauge board. Also installed on each board are a tachometer and pressure gauges on fuel oil, lube oil, jacket water and scavenging air. A separate alarm panel contains alarms on lube oil pressure and jacket water temperature. Ship's service electric power is sup-

Closeup of control end of the port Fairbanks-Morse O-P engine, showing Westinghouse Air Brake remote controls, Harper engine room telegraph and individual fuel injection pumps at each cylinder.



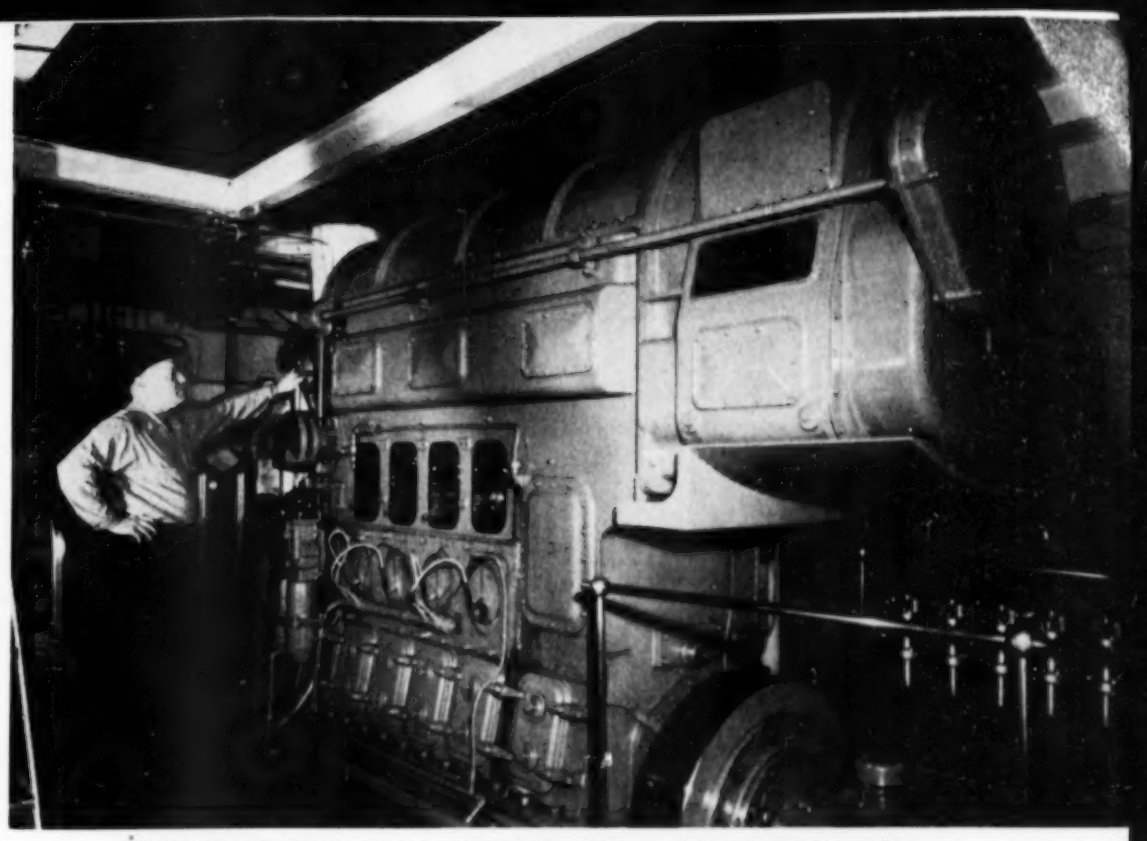
F-M engines are started with 250 lbs. of air pressure supplied by these two compressors. Gardner-Denver unit at right is driven by a 10 hp. F-M motor and Quincy standby unit at left by a 3 hp. F-M motor. Two of the vessel's four compressed air tanks are shown.



plied by two direct-current generators, one driven off the starboard tailshaft and rated at 20 kw., and the other driven by a 3-cylinder, 60-hp., 1200 rpm., model 49A Fairbanks-Morse diesel engine and rated at 25 kw., 125 volts, 200 amps. This power is distributed by a 3-panel, dead-front switchboard equipped with hand-operated switchgear and controls for all auxiliaries. The two 10-in., 1150 gpm. port and starboard cargo pumps installed on the *Keegan* are located in the forecastle. They are direct-driven through a through-bulkhead shaft and flexible coupling by a 103-hp., 1300 rpm., diesel. As already noted, these large-capacity pumps are capable of unloading the entire cargo in less than three hours.

Other pumping equipment installed on the *V. L. Keegan II* includes two 200 gpm. fire pumps, driven off the model 49A Fairbanks-Morse generator engine; a forward 3-in. bilge and ballast pump, driven by a 5-hp. motor; a 2-in. bilge and general service pump aft, driven by a 2-hp. motor; an "in port" fuel oil transfer pump, driven by a 2-hp. motor; and two "in port" day tank pumps, driven by ⅓-hp. electric motors. The modern, wide-view pilothouse is equipped with every conceivable aid to navigation, including a duplicate set of remote controls for the main engines, one set located port and the other starboard; a radar set; gyro-compass; radio-telephone; radio direction-finder; engine room telegraph; electro-mechanical steering system; and the usual searchlight and air horn. The crew is quartered aft and served in a completely equipped combination galley and mess hall.

Since going into service, the *V. L. Keegan II* has proved herself to be a "smart" vessel in every department. Carrying twice as much paying cargo per trip as her competitors, reaching ports no other vessel of her capacity has reached before and averaging almost one complete round trip per day, she is a credit to her designers and builders. This, coupled with the low 45 gal./hr. fuel consumption of her two O-P engines, makes the *Keegan* a highly profitable ship to operate.

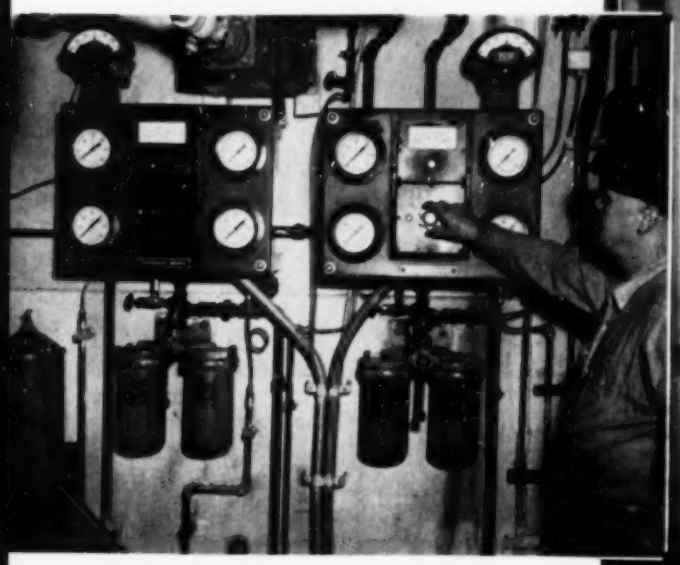


Chief Engineer Leirvik checks starboard F-M engine. Because of the compact design of these opposed-piston diesels, the vessel's designers were able to limit the size of the engine room, increasing her cargo space and capacity.

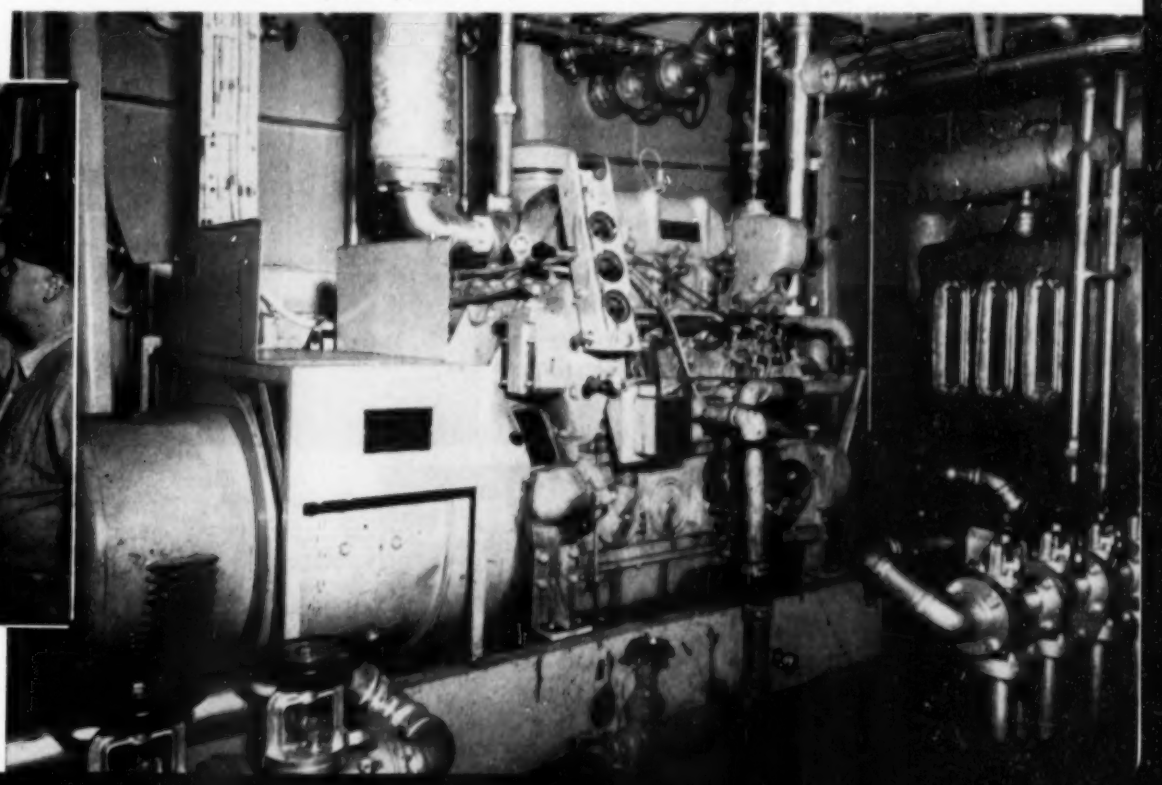
List of Equipment

Main engines—2 model 38D8⅛, 640-hp., 720 rpm., 2-cycle, 4-cylinder, 8-in. bore, 10-in. stroke, opposed-piston marine diesel engines, Fairbanks-Morse.
Main engine reduction gears—Fairbanks-Morse.
Main engine governors—Woodward.
Main engine duplex fuel oil filters—Nugent.
Main engine lube oil standby pump—Roper.
Main engine lube oil coolers—Kewanee-Ross.
Main engine heat exchangers—Kewanee-Ross.
Main engine automatic by-pass valves—Amot Controls.
Main engine alarm panels—Henschel.
Main engine alarms—Detroit Controls.
Tachometers—Weston.
Main cargo pump engine—Caterpillar.
Ship's service generator set—Fairbanks-Morse.
Starboard tailshaft generator—General Dynamics Corp.
Main batteries—Exide—Ironclad.
Main air compressor—Gardner-Denver.
Standby air compressor—Quincy.
In-port fuel oil transfer pump—Viking.
In-port day tank pumps—Roper.
Aft bilge and general service pumps—Viking.
Pyrometers—Alnor.
Main engine remote controls—Westinghouse Air Brake.

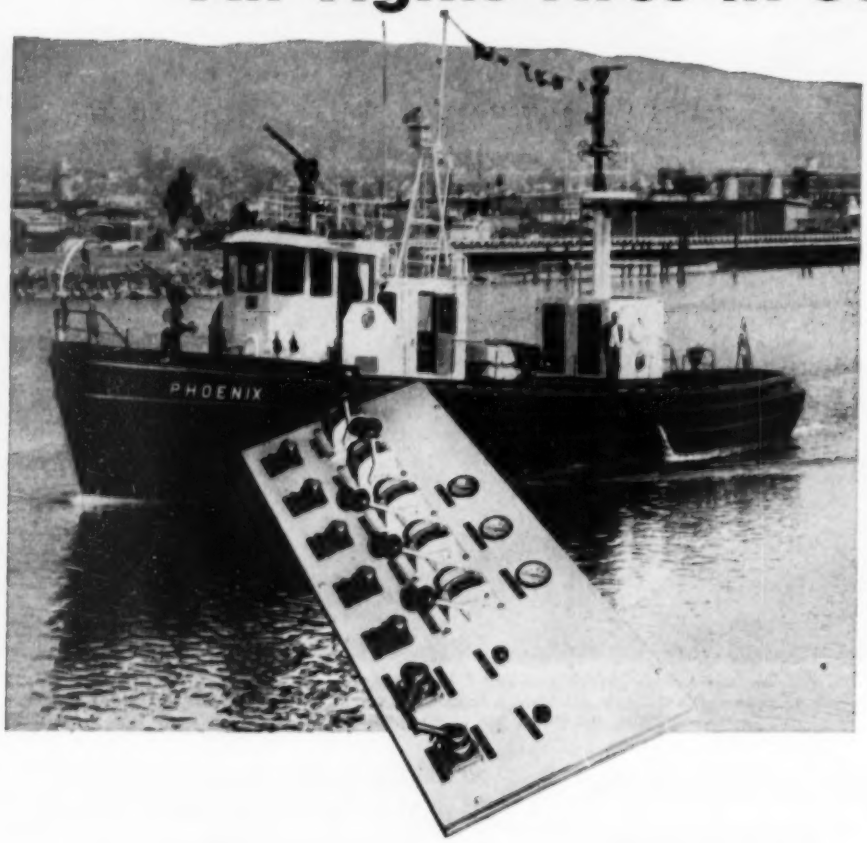
Hans Leirvik, chief engineer, checks Alnor exhaust pyrometer on one of two Fairbanks-Morse gauge boards serving the O-P engines. Also seen are the two Weston tachometers, Nugent duplex fuel oil filters and F-M lube oil by-pass filters (extreme left).



Ship's service electric power is supplied by this 25 kw., 125 volt, 200 amp., dc. generator driven by a 60 hp., 1200 rpm., model 49A F-M diesel engine.



Air Fights Fires in San Francisco



• Air is used to control every operation of the five propulsion and pumping engines of this new fireboat, now in service in San Francisco Bay. Two, dual-purpose 550-hp. diesel engines power the boat when it's under way. At the scene of the fire, these engines are converted quickly to water pumping, while two 110-hp. diesels maintain maneuverability and supply electricity. The fifth engine—another 550-hp. diesel—is used only to pump water for fire fighting.

Controlling these varying functions is quite a problem. The throttle and clutches of each engine must be integrated closely with the operation of all other engines. The engineer must be able to select any combination of engines or functions. The pilot, as well as the engineer, must be able to start the two main propulsion diesels. All of this must be done quickly, safely, and dependably. John Alden, who designed the boat, accomplishes this with a complete Westinghouse Pneumatic Control System.

Whether *your* boat is small or large, your control problem simple or complex, Westinghouse Air Brake Company can supply a suitable pneumatic control system—everything from cocks to compressors. Write for specific information.

Westinghouse Air Brake COMPANY

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Manufacturers of pneumatic cylinders, actuators, air control devices of all kinds, and engineered pneumatic control systems.

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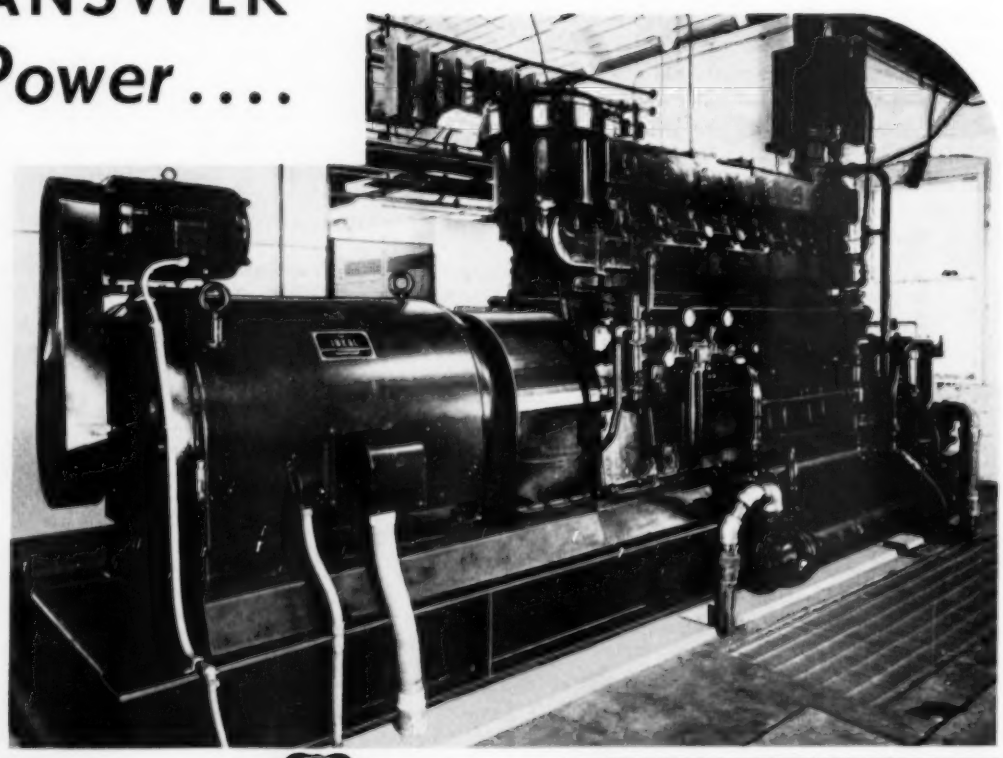
THE IDEAL ANSWER *For Stand-by Power....*

To assure dependable and adequate electric power for its water supply during any failure of its regular power source, the city of Attleboro, Mass., has installed an IDEAL GENERATOR.

The installation of diesel engine driven stand-by electric generators of this type has been greatly stimulated in communities throughout the country. They are a basic part of civil defense programs and protection against power line failure caused by storms and floods.

IDEAL Engineers work with you in developing a satisfactory answer to any need for emergency or continuous electric power supply. Write us today.



The IDEAL ELECTRIC & Manufacturing Co., Mansfield, Ohio

Builders of DEPENDABLE POWER EQUIPMENT for over 50 years

IDEAL AC Generator, Type SA 80% pf, 50 C, 375 KVA, 300 KW, 2400 volts, 3 phase, 60 cycle, 900 rpm.

THIS PUMP OPENED NEW DIESEL MARKETS...

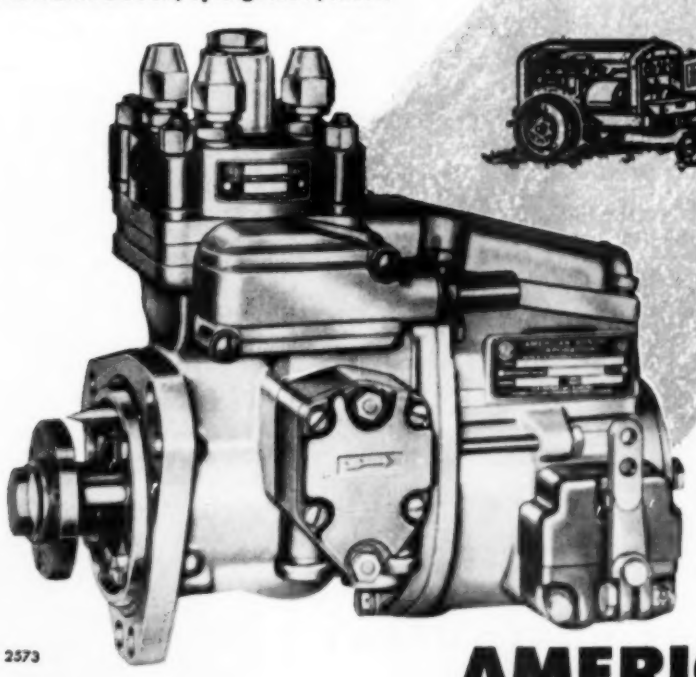
THE AMERICAN BOSCH "PSB"

American Bosch's development of the PSB single-plunger pump made it possible for engine manufacturers to produce the smaller, lower-cost Diesels which have opened up new markets for Diesel power. You see it serving everywhere —on efficient Diesels that power farm tractors, compressors, generating sets, boats and trucks in ever-increasing numbers.

Today, more Diesel engine manufacturers are using the American Bosch PSB as standard equipment than ever before. It's easy to see why —for the PSB gives both the engine manufacturer and the user a simplified, compact, lower-cost pump with a *proven* record of outstanding performance and dependability *plus* ease of servicing and low maintenance expense.

The PSB is a product of American Bosch's continuing program of research and development. It stands as a significant contribution to the progress of the Diesel.

AMERICAN BOSCH, Springfield 7, Mass.



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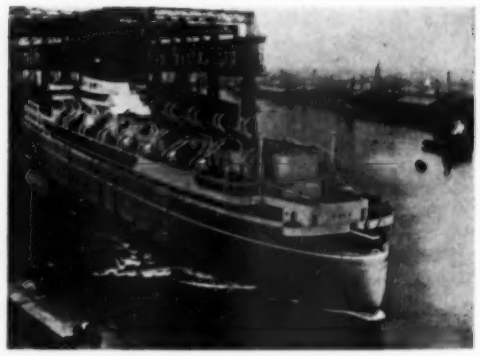
AMERICAN BOSCH

European Diesel News

By Hamish Ferguson

GAS TURBINE CAR. The Austin Motor Co., Ltd., Longbridge, Birmingham, members of the British Motor Corp., have announced brief details of a new gas turbine which has been fitted in a Sheerline chassis. The engine is rated at 125 bhp. and embodies a 2-stage centrifugal compressor driven by a 3-stage axial turbine. The drive to the axle is taken from an independent power turbine through a reduction gearbox. A heat exchanger is to be incorporated and it is hoped that it will improve fuel consumption.

S. S. "SOUTHERN CROSS." The new 20,000-ton passenger liner *Southern Cross* built by Harland & Wolff, Ltd., Belfast, was launched recently by Queen Elizabeth II. The main propelling machinery, manufactured by the builders, consists of a 2-shaft arrangement of compound, condensing, double-reduction, geared steam turbines developing 20,000 shp. at 120 rpm. Auxiliary machinery includes six diesel-electric generating sets manufactured by Mirrlees, Bickerton & Day, Hazel Grove, Stockport. The engines are of the K. 8 type, each direct coupled to a dynamo generating 600 kw. at 220 volts dc. There is another emergency diesel generator of 200 kw. output driven by a Harland & Wolff 4-stroke engine.



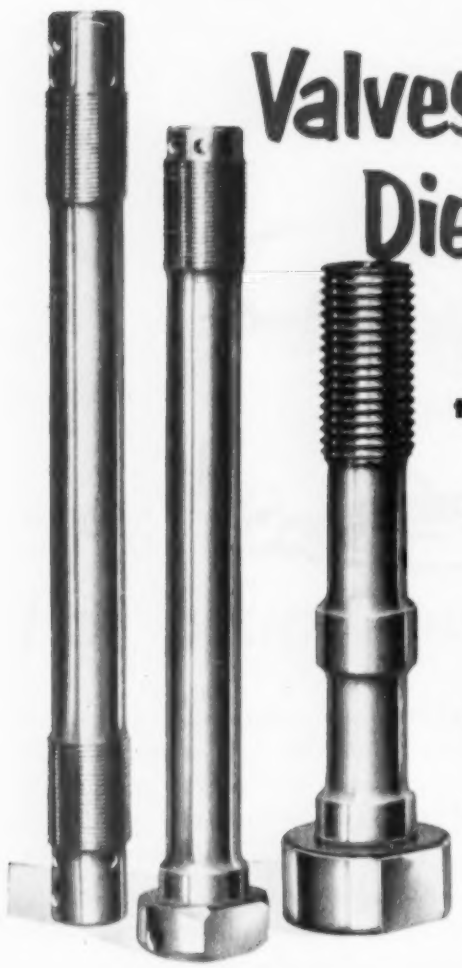
Auxiliary equipment for the S.S. "Southern Cross," the 20,000-ton passenger liner launched recently by Queen Elizabeth, includes six diesel-electric generating sets and an emergency diesel generator.

DIESEL MOTORCYCLE. The Freeman Sanders Engine Co., Ltd., Trembath, Penzance, Cornwall, designers of the combustion chamber used in Standard Motor Co. diesels, has converted a Norton motorcycle engine from petrol to diesel. An output of 16 bhp. at 4500 rpm. has been obtained on the test bench using a compression ratio of 12.8 :1. A fuel consumption of 120 mpg. is claimed, as compared with about 70 mpg. on petrol. Maximum speed is about 70 mph.

PERKINS' ORDERS. F. Perkins, Ltd., Peterborough, has received orders totaling nearly £500,000 from the Argentine for diesels for use in goods and passenger vehicles. One order is for 350 P6. (V) engines for installation in Chevrolet vehicles for Empresa Nacional de Transportes which operates the omnibus service in the city and province of Buenos Aires. Another order of comparable size was placed by the Asociasion Argentina de Empresarios del Transporte Automotor, and the engines will be fitted into Chevrolet and other makes of chassis.

PRESSURE-CHARGED VEHICLE ENGINES. There is an increasing tendency toward pressure-charging of vehicle engines, and a number of new models will be seen at the forthcoming Commercial Motor Show at Earl's Court, London. Among these will be: *Rolls-Royce.* A pressure-charged, 6-cylinder, vertical, 12.2 litre engine, developing 180 bhp. A pack-type heat exchanger is incorporated. *Thornycroft.* A turbocharged, 6-cylinder, vertical 11.3 litre engine, developing 200 bhp. at 1900 rpm. *Leyland.* A turbocharged, 6-cylinder, vertical, 9.8 litre engine, developing 185 bhp. at 2000 rpm. *Foden.* A pressure-charged, 12-cylinder, vertical, double crankshaft, twin-bank engine of 8.2 litres, developing 252 bhp. at 2000 rpm.

Latest Thornycroft supercharged 200 bhp. oil engine showing mounting of the supercharger.



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FIT FOR A BRIDE?—E. L. Ladd, executive vice president of United Aircraft Products, Inc., shows an office worker a gold-plated version—but not the marrying kind—of new metallic "O" rings now in production at United's Dayton, Ohio, plant for aircraft and industrial uses. The search for a metallic finish which can be applied to the sealing of both gases and corrosive liquids under high and low pressures and temperatures is in the experimental stage, Mr. Ladd points out. The metallic seals, both standard and self-energized, are made of such metals as steel, aluminum, copper and inconel and are plated with various metallic finishes for better sealing characteristics.

Nordberg Engineering Appointments

Ralph Miller

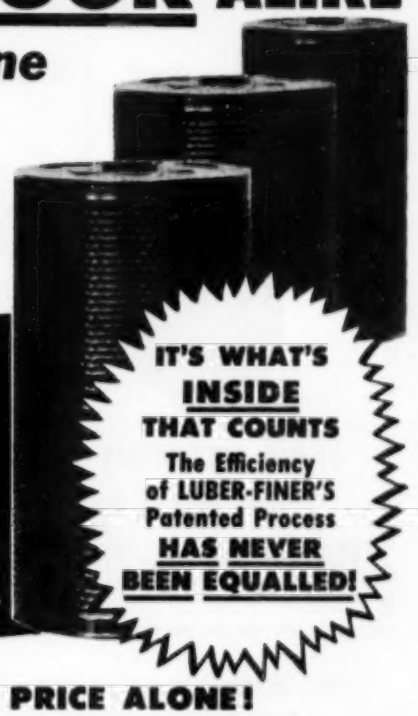
Appointment of Hans U. Lieberherr as director of engineering, Emil Grieshaber as director of projects development and Ralph Miller as consultant and director of Supairthermal development and application, heavy machinery division, is announced by Roland W. Bayerlein, vice president of the heavy machinery division of Nordberg Manufacturing Co., Milwaukee. Mr. Lieberherr was born in Switzerland and received his degree as a mechanical engineer at the Swiss Federal Institute of Technology at Zurich in 1928. He continued at the Institute for another year as a lecturer in thermodynamics. In 1929 he joined Sulzer Bros. in Winterthur as a designer for double acting 2-cycle engines. Mr. Lieberherr took a leave of absence to study mathematics and physics at Sorbonne University, Paris, and returned to Sulzer Bros. as research engineer on 2-cycle engines. In 1936 he was named chief engineer in charge of design of Navy-type engines for submarines and surface vessels. He continued in this capacity until 1949 when he joined the Nordberg Manufacturing Co. as technical representative throughout Europe, establishing headquarters in Paris.

Mr. Grieshaber was also born in Switzerland. Upon graduation from Technical Institute, Winterthur, Zurich, in 1913, he joined Usines Carels Freres in Ghent, Belgium, where he was active in experimentation and development of diesel engines under license granted to Carels by Dr. Rudolph Diesel. In 1915 he joined Nordberg in Milwaukee. Emil Grieshaber provided technical assistance in the development of the early diesel engines built by Nordberg. He was later appointed head of the steam engine and compressor department, in 1936 became chief engineer. Ralph Miller, a native of Denmark, was graduated from Teknikal Hojskole in Copenhagen. After serving in the Danish Navy, be came to the United States where he was employed by the De LaVergne Machine Co. He was assigned to assist W. T. Price in the development of the first American cold starting, solid injection engine. Engine design and development work followed with the Ingersoll Rand Co., Superior Engine Co., American Locomotive Co., and Worthington Corp. Mr. Miller has been a prominent figure in the development of internal combustion engines in the United States and Europe for many years. He is widely known for his work on the first American diesel engine for railroad service, the first supercharged dual-fuel engine, the first American 4-cycle supercharged "V" engine for locomotives and the Miller system of turbocharging. In 1945 he joined Nordberg as chief engineer of the 4-cycle engine department.

Emil Grieshaber **H. U. Lieberherr**

FILTERS MAY LOOK ALIKE

But ONLY Genuine Luber-finer PACKS



Give the Results Enjoyed by MILLIONS OF SATISFIED USERS THE WORLD OVER

IT'S WHAT'S INSIDE THAT COUNTS
The Efficiency of LUBER-FINER'S Patented Process HAS NEVER BEEN EQUALLED!

DON'T BE MISLED BY PRICE ALONE!

There is NO substitute for DIESELPAK'S Patented Filtering Process for H. D. Compounded oils AT ANY PRICE. The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than any other filtering element. It PAYS to get the BEST!

✓ PROTECTS ENGINE

The DIESELPAK is designed to remove not only ABRASIVES but also CONTAMINANTS such as moisture, carbon, acid, etc. from oil, and is engineered to keep the filtering media and the removed contaminants from migrating back into engine. The DIESELPAK assures continuous protection that reduces engine wear and maintenance costs far beyond that possible with other types of filter elements.

✓ EXTENDS PERIODS BETWEEN DRAINS

The DIESELPAK collects and holds even the most finely dispersed contaminants without affecting or removing compound additives from the oil. A glance at the dip stick will show that the oil is CLEANER—symbol of better lubrication and longer oil life enjoyed only by Luber-finer users.

✓ TAKES LESS OIL

The DIESELPAK because of its engineered construction requires 2 to 4 quarts less oil than spongy substitute filter elements being offered for use in the Luber-finer housing. This is an additional saving enjoyed when using the DIESELPAK.

STANDARD of the INDUSTRY SINCE 1936

Since Luber-finer was first introduced to the public in 1936, it has gained worldwide acceptance by millions of satisfied users everywhere. Luber-finers are approved by major oil companies and petroleum engineers. Luber-finers are standard or optional equipment on America's foremost stationary engines, diesel trucks, tractors and earth-moving machinery.

LUBER-FINER PACKS AVAILABLE:

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2. ***DIESELPAK***—First made available in 1941, the DIESELPAK was primarily designed for use with H. D. detergent compounded oils under the direction of Dr. Ulric B. Bray, B.S., Ph.D., F.A.I.C., internationally known Petroleum Chemist. The DIESELPAK has also achieved outstanding results when used with fuel oils and straight mineral oils.

GET THE FACTS FREE!

Why take chances with expensive equipment? WRITE TODAY for complete information on what to look for before you buy either Filters or Replacement Packs—see how you can save many dollars and hours in maintenance.

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BIG NEWS

FOR ALL DIESELS!

FRAM completely removes water from diesel fuel with NEW WATER SEPARATOR & FUEL FILTER

✓100% Water Removal! ✓Traps Dirt and Dust!
✓Cuts injector maintenance costs!
✓Reduces down-time!

The new FRAM Water Separator & Fuel Filter is a double-action filter for complete injection system protection—

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Save the cost of replacing expensive injectors! Guard your diesels for longer life . . . less wear . . . fewer repairs—with the new FRAM Water Separator & Fuel Filter! For specific installation information write: FRAM CORPORATION, Providence 16, R. I. Fram Canada Ltd., Stratford, Ont.

IMPORTANT!
Diesels already equipped with FRAM Fuel Filter need only the Water Separator Filter and a new FRAM Coalescer Cartridge for 100% water removal!

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FILTERS

Dieselization in Mining Industry

Delegates to the recent 1954 convention and exposition of the American Mining Congress in San Francisco heard reports by a number of company officials who detailed the increasingly important role dieselization is playing in the nation's mining industry.

Earl H. Miller, an official of the U. S. Potash Co. mine at Carlsbad, N. M., described the successful conversion of dieselized highway trucks for underground operation. By removing the cab and hood and putting the driver's seat and truck controls outside the frame to clear the low haulageway ceiling, Mr. Miller said, three tractor-trailer units have hauled approximately 350,000 tons of waste salt into mined-out areas of the mine. He said diesel engine use underground is made possible by use of exhaust scrubbers which cool 850° F. exhaust gases to less than 180° F. and remove the aldehyde odors. Carbon monoxide is reduced to less than a trace in the mine air by keeping the engines in good repair and adjustment.

H. A. London, superintendent of maintenance for the Duval Sulphur & Potash Co., also of Carlsbad, described the rapid growth in the use of dieselized equipment. He said the Bureau of Mines has experimented intensively with diesel equipment which can be adapted to deep operation. Mr. London's firm uses many types of underground dieselized equipment, he said, the latest of which is a roof-bolting machine.

Modern pit equipment, milling practices and diesel truck haulage have bolstered continued operation of the Silver Bell copper mine in New Mexico —a 7500 tons per day open pit operation—according to T. A. Snedden, manager of the south-western division of the American Smelting & Refining Co., of Tucson, Ariz.

Heavy Oil Purification Data

In view of the growing use of low-cost heavy fuel in diesel engine operation, Centrico Inc., of Englewood, N. J., distributor of Westfalia centrifugal separators, has prepared a new 16-page booklet, "Centrifuges for Oil Processing." The booklet gives performance data on Westfalia's three oil separator models for purifying fuel and lube oils and describes Westfalia's new hydraulic lifter and exchangeable bowl liners. Copies of the publication, Booklet No. 205, may be obtained by writing to the firm at 75 W. Forest Ave., Englewood, N. J.

Dr. Diesel Visits U. S.

Dr. Eugen Diesel, son of the inventor of the diesel engine, has arrived in the United States to deliver several lectures on technical science and to report on the reconditioning of the Deutsche Museum. It is his first trip to this country since his visit after World War I. Dr. Diesel, a doctor of philosophy and a writer, resides in Bavaria. He is a member of numerous German scientific organizations and a director of the Deutsche Museum in Munich, one of the world's largest institutions for natural and technical sciences.

Sewage Plant Equipment Contract

Worthington Corp. of Harrison, N. J., has been awarded the contract for supplying equipment for the first sewage plant to be constructed at South Bend, Ind. The Worthington equipment will include two 6-cylinder, 735 hp. dual-fuel engines driving blowers, two 4-cylinder, 275 hp. dual-fuel engines driving two vertical mixflo pumps and three compressors with motors. Additional equipment includes a compressor with gasoline engine, seven centrifugal pumps with motors and one centrifugal pump with gasoline engine. The new plant will be located along the St. Joseph river on the northern outskirts of South Bend, according to O. J. Shoemaker, Inc., contractor for the project.

New Distributor Named

Gorton Pew Fisheries Co., Ltd., of Gloucester, Mass., has been appointed distributor in Massachusetts, Rhode Island, the Maine coast and seaports for the engine division of National Supply Co. The firm takes over duties formerly handled by National Supply's branch office in connection with sales and service of Superior, Atlas and Lister diesel engines for marine use.

B. D. Fish continues as branch manager in the New England territory. Spencer A. Dagle, associated for many years with the Atlas Imperial diesel, is now with Gorton Pew.

Engine Distributor Named

R. B. Richardson Co. of 4550 Boston West, Detroit, has been appointed distributor in Michigan for National Supply Co.'s engine division. Richardson will handle Superior and Atlas engines in diesel, gas and dual-fuel types and Lister diesel engines. The firm has been a distributor to Michigan industry since 1913.

EXPERTS ON THE DRAWING BOARD

The skills and experience of the men who design Pritchard cooling towers is your assurance that Pritchard can give you the best answer to cooling problems, in your diesel operation.

In years and years of accumulated experience, these Pritchard engineers have learned how to meet the complex cooling requirements of modern industry. Learned so well, in fact, that every Pritchard-designed tower is *guaranteed* to do the job specified for it.

You can have such dependable cooling performance. Choose experienced design by Pritchard!

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Representatives in Principal Cities from Coast to Coast

Design Changes in D13000

New changes in the design of its D13000 diesel engine resulting in increased outputs have been announced by the engine division of Caterpillar Tractor Co. The engine shows increases of from 1000 to 1225 rpm. and from 120 to 150 hp. The D13000 diesel-electric set now operates at 1200 rpm. and has an increase in capacity from 80 to 100 kw.

Increased output in the 6-cylinder, 4-stroke cycle engine resulted in a number of major changes. Positive action valve rotators, replaceable valve seat inserts and larger, stronger valves are standard. Vibration-free operation is made possible by the use of a sturdy, metal-enclosed vibration damper fastened directly to the front of the crankshaft. Use of the vibration damper is optional in installations where the engine speed is kept below 1000 rpm.

Improved high lift cam profiles give the new D13000 better valve seating and increased breathing ability. In addition, a new oil-bath air cleaner and larger intake and exhaust manifolds help handle the additional air required by the more powerful engine. Added to the engine is a new, larger water pump with greater capacity. A new face-type seal requiring no adjustment by the operator is now used in the water pump. Larger water lines and water manifold supplement the pump to provide improved cooling. There are now only two operating adjustments needed on the D13000: fan belt adjustment and infrequent valve clearance setting.

New, oil-cooled pistons in the D13000 are made of high-strength, lightweight aluminum alloy with stainless steel heat plugs in the high temperature zone and cast-in iron bands for the top ring groove. New piston pins of aircraft quality steel and sturdier connecting rods help the pistons carry the greater loads imposed. The new engine's oil pump features throttling valve pressure controls to assure correct lubrication for all moving parts. Oil pick-ups are provided at the front and rear of the crankcase to insure an adequate oil supply to the pump if the engine should be tilted during operation.

Steam Cleaning Gun

The equipment division of Magnus Chemical Co., Inc., Garwood, N. J., has added a new steam-solution cleaning gun to its diversified line of cleaning and processing equipment. The Magnus steam gun is suitable for cleaning and paint stripping of all types and sizes of machinery and equipment. It is lightweight, cool to handle and easy to use, the manufacturer points out, and requires only a supply of live steam, a container of cleaning solution and hose lines. No booster pump, motor or tank is required. Passage of steam through the gun syphons the cleaning solution into the gun where it mixes with the steam and then is discharged from the high-velocity nozzle. Strength of the cleaning solution may be varied by turning the solution valve. Closing the valve enables the user to rinse with plain steam. The steam gun is available in two heavy-duty models. Further information may be obtained by writing to the manufacturer.

New York Branch Manager

Frederick C. Johnson, formerly manager of the scale department, has been appointed manager of the New York branch house of Fairbanks, Morse & Co., succeeding Tom W. Drennen. Mr. Drennen resigned because of poor health. Mr. Johnson, a native of Boston, attended Boston Technical School and Massachusetts Institute of Technology, where he received a degree in mechanical engineering in 1934. He joined Fairbanks-Morse's Boston branch as a clerk. Following Army service in World War II, Mr. Johnson became scale department manager of the San Francisco branch from 1945 to 1949. He then was transferred to the New York branch. He is a professional engineer in California and Rhode Island and is a member of the National Scale Men's Association.

District Manager Appointed

Ohio Crankshaft Co. has named A. O. Wood, former district manager, to the post of Chicago district manager for the TOCCO division. He will be responsible for sales, engineering and service of TOCCO induction heating equipment in the district. Mr. Wood has been with Ohio Crankshaft since 1929. He started as an electrician in the cam and crankshaft division and in 1937 was transferred to the then new TOCCO division where he soon became chief engineer in charge of development and design.

Comptroller Elected

The election of John B. Dickey as comptroller of Michiana Products Corp., Michigan City, Ind., has been announced by President Nathaniel E. Duval. Michiana makes alloy castings and diesel and gas engine filters. Mr. Dickey has been with Michiana as assistant comptroller since 1951. He became acting comptroller last April. A Navy veteran and a graduate of Indiana University, Mr. Dickey formerly was with the Chicago office of Arthur Andersen & Co.

Sales Manager Named

Aeroquip Corp. of Jackson, Mich., producer of flexible hose lines and self-sealing couplings, announces the appointment of Charles W. Sawhill as general sales manager of Aeroquip's West Coast subsidiary, Aero-Coupling Corp., Burbank, Calif. Mr. Sawhill was affiliated with Douglas Aircraft Co. for several years and participated in the development of the DC-4 and DC-6 airplanes.

the static seal story

complete coverages as indicated by these sub-headings

- THE STATIC SEAL PROBLEM
- APPLICATION OF THE SELF-ENERGIZED METALLIC O-RING
- DESCRIPTION OF THE SELF-ENERGIZED METALLIC O-RING
- ENGINEERING DESIGN DATA
- MECHANICAL BACK-UP
- O-RING SQUEEZE
- SURFACE FINISH
- COMPRESSION LOADS REQUIRED TO INSTALL
- RESILIENCE
- LIMITATIONS — PRESSURES — TEMPERATURES
- CORROSION RESISTANCE
- DESIGN LIMITATIONS
- SUMMARY

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West Coast Diesel News

By James Joseph

THE VENERABLE, 55-year-old tugboat *Manzanita,* a stalwart to Puget Sound, has been repowered with GM 6-110 tandem-twin diesels. Owned by Olson Tugboat Co., Tacoma, the *Manzanita's* tandem-twin diesels consist of two GM 6-110 marine engines in line, and driving a single output shaft. With engines turning a 60x5 3-blade wheel through a 5-to-1 reduction gear, craft has been logged at 10 knots at 1600 rpm. She carries 5000 gallons of fuel, enough for 200 hours.

ORANGE COUNTY (Calif.) Sanitation Dist. No. 3 has purchased a 200 hp. Buda model 8MO-1290 LPG engine from Anderson-Bevier Co., Inc., of Los Angeles.

TO THE NAVY'S Bureau of Yards and Docks, Port Hueneme, Calif., two 100 kw. Buda 6DC-1879 diesel engines, by Gregory Electric Co.

FOR ITS Dana Point compressor plant cooling tower, Southern Counties Gas Co. (Calif.) has installed a 60 hp. Buda model 6MO-672 natural gas engine.

CHEHALIS, Wash.'s Frank Danzer has replaced his 4-71 GM Sawmill engine with a new GM 6-71. The 4-71 had run 7 years without a shutdown or overhaul of any sort. The new engine will handle additional equipment.

GLENN BROS. of Orting, Wash., have purchased a GM 4-71 sawmill engine for their 10,000 bd. foot-a-day portable mill . . . from Seattle's Evans Engine and Equipment Co., Inc.

TO POWER his new, completely mechanized portable mill, Alvin Taylor, Chehalis, Wash., has installed a new GM 6-110. Taylor also uses a 4-51 GM on the log haul and cutoff saw.

LOMITA, Calif.'s R. H. Gale has installed a GM 2-51 to power (auxiliary) an ice machine, bait pump and generator on his fishing boat, *Carolyn D.*

CROFTON DIESEL Engine Co., Inc., San Pedro, Calif., has replaced a gasoline unit with a GM 4-51 (with 4:1 reduction and heavy duty F. P. T. O.) on the 38-ft. Kettenberg commercial fishing boat, *Ebb Tide.* Boat is owned by David B. Wright, Berkeley, Calif.

THE COMMERCIAL fishing boat *Skrem B* (owned by William Szabo, Avalon, Calif.) has been installed with a GM 4-51, with 4:1 reduction. The 38-ft. long, 11-ft. wide *Skrem B* has a long cruising range.

CROFTON DIESEL Engine Co., Inc., has placed two new 6-110 GM diesels, model 62203 in Carl Tilden's converted 63-ft. AVR. Tilden is an owner of Tilden Tool Mfg. Co., San Clemente, Calif. The AVR, the *Blue Seas,* is capable of 21 mph. and planes freely and continuously at 18 mph. Engines are symmetrical right and left matched pair for turning outboard wheels size 26x26 thru 1½:1 reductions.

CURRENTLY under construction at The Union Diesel Engine Co.'s Oakland factory are diesel generator sets destined for municipal power plants at Cheju, on the island of Cheju-Do, between the East China Sea and the Yellow Sea. A second set is being fabricated for the City of Mosulpo, located along the southwest coast of Korea.

ANOTHER DIESEL set (abuilding in Union's Oakland, Calif., plant) is destined for the city of Soguipo in the Korea Strait. A fourth is being made-up for the City of Hallim on Quelpart Island, off the China coast.

UNION DIESEL Engine Co. reports successful trials on the Navy Radio Transmitter Station at Monogram, Virginia. Station has three 600 KW Union diesel generating sets.

CLYDE HINES, Springfield, Oregon, recently repowered an LSFW Mack with a 6 DA-844 Buda diesel, for log hauling in the Eugene-Roseburg area —sale thru Hamilton Engine Sales, Inc., Portland.

SOUTH COAST CO. has just purchased two GM 2-71 diesel engines from Crofton Diesel Engine Co., Inc., San Pedro, Calif.

ONE OF THE few sternwheelers for Alaskan rivers is being built by Jim Binckley, president of the Alaska Riverways Co., College, Alaska. The 65-ft. sternwheeler, the *Adventure,* designed by naval architect William Garden, will be powered by a 165 hp. GM diesel, driving thru a Western Gear Works reduction gear. She'll have 10 buckets on a 10-ft. dia. stern wheel and will carry passengers on day excursions. Her steel plating will come from Japan. *Adventure* will be welded construction, with twin smokestacks.

TO CLACKAMAS County (Ore.) Highway Department, a 6DA-844 Buda diesel to power a rock crusher.

NEWPORT, ORE.'s Newport Sand & Gravel Co. has taken delivery of a 10-B Bucyrus-Erie excavator, equipped with a 6B-230 Buda engine, through Portland's Hamilton Engine Sales, Inc.

TO COOS COUNTY (Ore.) Road Department, a new Bucyrus-Erie shovel powered with a model HP-351 Buda.

HORSEPOWER

. . . a size and type for every need

Whether it's repowering old equipment or buying new — too much or too little horsepower can prove costly. Equally as important as proper horsepower, is correct engineering of the application. Quite often, it is necessary that engine accessories be mounted in accordance with requirements of the equipment. It usually takes a right size and right design to supply the specific power needs for each type of machinery.

The engineering and sales policy of Hercules Motors Corporation is to design and sell internal combustion engines to fulfill the specific needs of each customer. For example, in equipment with limited engine installation area, "flat" or horizontal engines are often the answer. These engines can be placed under floors, or in any area which does not permit vertical installation. (Consult factory for models available.) Special Hercules vertical engines with accessories located on one side, permit installations near a firewall or bulkhead which is permanent and does not allow access to one side of the engine. These are but a few of the many problems which are often encountered in the proper application of an engine.

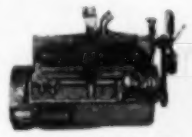
Our basic line of Hercules engines, 70 models from 3 to 500 H.P., is designed and engineered to meet the exact and varying demands of industry. We build engines for operation on gasoline, diesel fuel, natural gas, L. P. Gas, kerosene, or any other standard fuel that is readily available. That's why we have been known as "Engine Manufacturing Specialists Since 1915"

If you'd like to know more about our engines, write for the folder "Hercules Engines". It lists the sizes and power ratings of each model. If, however, you have a specific power problem give us the details. Our engineers will work with you to solve your problems and of course, there is no obligation.

Engine Specialists since 1915

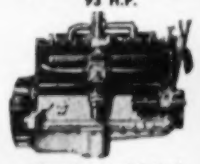
Hercules Model NXB
2 cylinder gasoline engine
15.6 H.P.

Hercules Model DOOD
4 cylinder diesel engine
79 H.P.



Hercules Model JXD
6 cylinder gasoline engine
112 H.P.

Hercules Model DIX6D
6 cylinder diesel engine
93 H.P.



Hercules Model HXE
6 cylinder gasoline engine
236 H.P.

Hercules Model DFXHF
6 cylinder diesel engine
260 H.P.

Hercules Model DNX-V8DTS
8 cylinder diesel engine
500 H.P.

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HERCULES MOTORS CORPORATION

127 Eleventh Street, S. E. • Canton, Ohio

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WITH

Bendix STARTER DRIVES

CHECK and COMPARE THESE FEATURES

- Starting motor can be mounted more easily and in more positions.
- Requires no actuating linkage—solenoid can be placed in any convenient position.
- Simple in design—has fewer parts—needs fewer adjustments.

Yes, it costs less to install a Bendix* Starter Drive, but that's only part of the story. The outstanding efficiency of the Bendix Drive has been performance proven in over 100,000,000 installations. No other starter drive approaches this record. Whatever your type of diesel, or whatever its purpose, for more dependable all-around performance it pays to specify Bendix Starter Drive.

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Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

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illustrated above at 50 diameters, on the bores of Diesel engine liners, seats piston rings in not more than two hours, develops and sustains more power for doing more work and faster work.

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PENNINGTON CHANNELCROMIUM CO.

319 Dakota Street San Antonio 3, Texas

Gulf Coast Diesel Notes

By Michael T. Pate

BLUDWORTH SHIPYARD, Houston, has bought through Stewart & Stevenson Services, Inc., a matched pair of General Motors series 110, model 62203, 300 hp. diesel marine propulsion units equipped with 2:1 hydraulic reversing and reduction gears. The diesels will be used to power a 65-ft. steel crew boat for offshore drilling service. The same craft will also use a Stewart & Stevenson model 2-MD15 ac. generating set driven by a General Motors model M2061-A, 34 hp. diesel and a Stewart & Stevenson Model PMD 6 ac. generating set powered by a Petter diesel model AV2.

BRAZOS ENGINEERING CO., Houston, has bought through Big 3 Welding & Equipment Co., Houston, a 300 amp. Lincoln welding machine driven by a model 2055, 34 hp. General Motors diesel, which will be used for shop welding.

SUPERIOR OIL CO., Houston, has bought through Power Specialties Co., Houston, one model DA 779 Buda diesel rated at 75 hp. and two Buda diesels, model DC 2505, rated at 238 hp., which the company will use in its waterflooding project near Crossville, Ill.

ANACO WELL SERVICE CO., Odessa, Texas, and Anaco, Venezuela, has obtained through Stewart & Stevenson Services, Inc., Houston, a General Motors series 71 twin-4 model 8107 diesel unit complete with torque converter and Torqmatic transmission which will be used to power a Gardner-Denver model PA8 pump for mud service. The company also bought a Stewart & Stevenson model 2 GD 21 ac. generating set powered with a General Motors series 71, model 2030-C diesel which will be sent with the larger unit to the company's Venezuelan operation.

HARMS MARINE SERVICE, Orange, Texas, has bought through Houston Engine & Pump Co. two Murphy model M-185, 185 hp. diesels which will be used in the company's new tugboat, driving through 3:1 Snow-Nabstedt reversing and reduction gears.

KERR-McGEE INDUSTRIES, Inc., Oklahoma City, has bought through Big 3 Welding & Equipment Co., Houston, a 300 amp. Lincoln welding generator, powered with a model 2055, 34 hp. General Motors diesel. The unit will be used in offshore drilling operations.

BLUDWORTH SHIPYARD, Houston, has bought through Stewart & Stevenson Services, Inc., Houston, two model 62203, series 110 General Motors diesels, rated at 300 hp. each. The matched pair will drive through 3.75:1 hydraulic reversing and reduction gears a 55 ft. steel twin-screw towboat being built for Dalahite Boat Service of Galveston. The tug will also use a Stewart & Stevenson model 2 MD 20 dc. generating set powered by a General Motors model 2061-A diesel.

STONE OIL CO., Hobbs, N. M., has bought through Waukesha Sales & Service, Houston, a model 135 DKBS, supercharged diesel engine rated at 185 hp. at 2800 rpm. The Waukesha will be used to repower a truck and is the third such unit put in service by the company.

THE GOLDEN ROD CORP., El Campo, Texas, has bought from Mustang Tractor & Equipment Co., Houston, a model D-13000 Caterpillar diesel which will be used to power a deep well irrigation unit. The diesel is rated at 150 hp. continuous at 1200 rpm.

WESTERN CO., Midland, Texas, has bought through Stewart & Stevenson Services, Inc., Houston, two General Motors series 110, model 62403 General Motors diesels equipped with torque converter and Torqmatic transmission to power Western pumps for sand-frac service.

L. & L. WELDING Supply Co., Houston, has bought through Big 3 Welding & Equipment Company, Houston, a 300 amp. Lincoln ac. welding unit powered by a model 2055 General Motors diesel rated at 34 hp. continuous loading. The unit will be used in the company plant.

STEEL TANK CONSTRUCTION Co., Houston, has bought two Stewart & Stevenson model 110 GD 100 special ac. generating sets to power arc welding lines in the company shop. The units are powered by GM model 62403 diesels.

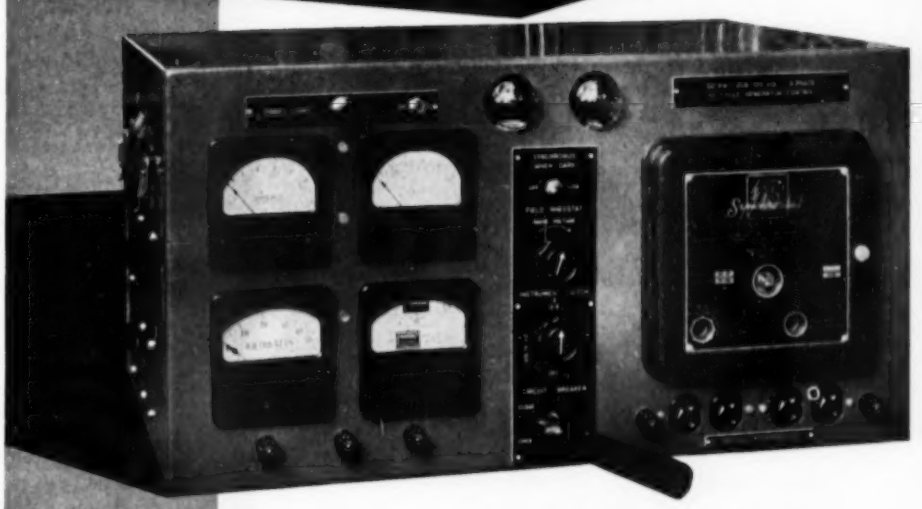
MORALES CORP., El Campo, has bought through Mustang Tractor & Equipment Co., Houston, a model D-13000 Caterpillar diesel rated at 150 hp. continuous at 1200 rpm. The diesel will power a deep well irrigation unit.

BROWN & ROOT, Houston, have obtained through Stewart & Stevenson Services, Inc., Houston, a Stewart & Stevenson model 110 GD 100 ac. generating unit delivering 100 kw. for arc-welding services. The unit is powered by a General Motors model 62403 diesel. The set will be shipped to Haiti for use in the company's operations there.

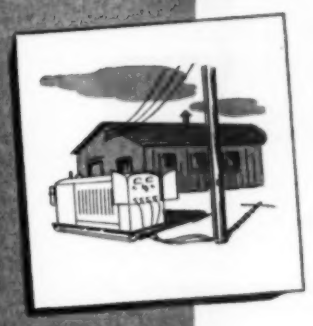
Annual Meeting Set Nov. 10-13

The 62nd annual meeting of the Society of Naval Architects and Marine Engineers will be held in New York City at the Waldorf-Astoria Nov. 10-13. The council, governing body of the organization, will meet Wednesday, Nov. 10. Technical sessions in the morning and afternoon of Nov. 11 and 12 will follow and are open to the entire membership and guests. A business session for members is slated for the afternoon of Nov. 12, at which time a new president will be elected for a 2-year term to succeed William E. Blewett, Jr., who is president of the Newport News Shipbuilding and Dry Dock Co. The annual banquet for members only is set for the evening of Nov. 12 and the annual dinner-dance for members and guests will be held Nov. 13. The society now has 6433 members.

DIESEL DRIVEN GENERATOR CONTROLS
for Industrial or Military Applications



Typical unit control for generators of 15-150 KVA capacity with complete metering, regulating, synchronizing and protective devices.



LAKE SHORE can custom-engineer and build a variety of units in A. C. and D. C. types for engine generator manufacturers. Models for either portable or fixed installations can be furnished for industrial applications as well as to government specifications. Special constructions for arctic or tropical use also can be supplied.

LAKE SHORE diesel driven generator controls have capacities ranging from 10 to 250 KVA, 600 volts maximum.

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ENGINEERS • DESIGNERS • FABRICATORS

Florida Diesel News

By Ed Dennis

HOMESTEAD'S new additions to its power plant are expected this month, and will include two Fairbanks-Morse diesel units, one having a horsepower of 1600 and a kw. rating of 1125 and the other 3500 hp. and 2500 kw. Both are expected to use heavy fuel oil.

DESIGNED for the Marine Studios at Marineland, the 46-ft. *Porpoise II* is a live specimen collecting vessel, designed specifically to capture and transport live fish. It is powered with a GM 6-71 of 133 shp. and has GM 3:1 reduction and hydraulic gears. Its speed is 14 mph.

CUMMINS Diesel Engines of Florida sold to the Lee-Tide Water Cypress Lumber Co. of Copeland a 150 hp. model H6 Cummins diesel with a Twin Disc torque converter for a log skidder. Also a similar engine to the Universal Concrete Pipe Co. at Dania.

THE GENERAL ENGINE & Equipment Co. at Tampa delivered to the Blake Lumber Co. a 165 hp. General Motors diesel of the 6-71 series with a GM power take-off, to be used in a saw mill.

AT BREWSTER the American Cyanamid Co. received a Caterpiller D8 "U" dozer tractor from the Rozier Equipment Co. of Tampa to be used in stock pile work.

A CUMMINS DIESEL of 165 hp. at 1800 rpm. for the 46-ft. lugger *Jane Margaret* with 3:1 Twin Disc reduction gears for Emile Perez of Yscoskey, La.

FROM HAITI, the M/V *Church Bay* with 7000 stalks of bananas for Florida, powered with two 320 hp. Atlas diesels and a 30 kw. Hercules diesel-generating set. Lambert Sands is the chief engineer of the *Church Bay*.

THE NEW 135-FT. feeder cargo vessel M/V *Kpo* has for propulsion two GM diesels developing a total of 290 bhp. The port auxiliary is a 72 hp. GM diesel while the starboard has a 2 kw. Fairbanks-Morse diesel-generating unit. Maxim M3 silencers are used.

TAMPA MARINE CO. built the newly launched *Miss Forsythe*, a fishing vessel powered with a General Motors diesel 6-110 and GM hydraulic gears which were supplied by General Engine and Equipment Co., Tampa.

DIESEL BRIEFS: For the West Indies 10 Mack tractors with Cummins diesels and a D8 Caterpillar dozer; the freighter *Babun* of Port Cortez, Honduras, with two 350 hp. Superior diesels, and the beautiful 112-ft. *Caribee* with a 6-cylinder Buda auxiliary engine.

DIESEL ENGINE SALES of St. Augustine launched the 67-ft. trawler *Dave*, powered with a D337 Caterpillar diesel and Twin Disc pto.

THE 28TH ANNUAL convention and American Merchant Marine Conference of the Propeller Clubs of the U. S. will be held beginning Dec. 5 in Miami. According to Larry Nelson, vice president, a record attendance is expected.

Fairbanks Morse & Co. selected a Quincy Compressor to supply compressed air for starting this new apposed piston diesel. Like other leading diesel engine manufacturers, Fairbanks Morse used a Quincy because it gives long life and trouble-free service.

Specify a Quincy Compressor for your next diesel starting job. Compact, rugged Quincy Compressors will give you a dependable air supply.

There's a Quincy Compressor for every job. Let us help you select the right model from a variety of mountings and sizes from 1 to 90 C.F.M.

Write Dept. K-40, Quincy Compressor Co., Quincy, Illinois, for catalog on Quincy Compressors for diesel starting.

MAKERS OF THE WORLD'S FINEST AIR COMPRESSORS

QUINCY COMPRESSOR CO.
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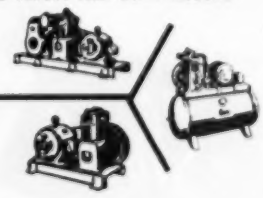


WESTINGHOUSE PURCHASES SCHNEIDER CORPORATION

Westinghouse Electric Corp. has purchased all the capital stock of the Schneider Manufacturing Corp., Muncie, Ind., according to Gwilym A. Price, Westinghouse president. The purchase price was not disclosed.

With the acquisition of the Muncie firm, which manufactures and licenses the manufacture of torque converters, Westinghouse is entering a field that is "a natural adjunct to production of power transmission equipment," Mr. Price said in Pittsburgh following announcement of the purchase Oct. 4.

The Westinghouse gearing division's Nuttall plant, located in the Lawrenceville district of Pittsburgh, produces many types of gears, including power transmissions, largely for industrial applications.

Sales Development Manager

Appointment of Lee L. Morgan as manager of the sales development division has been announced by W. K. Cox, manager of the sales promotion department of Caterpillar Tractor Co. Mr. Morgan was promoted from assistant sales manager of the plains division.

E-M "Packaged" Generator *Bulletin*

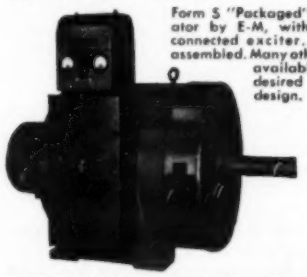
"ON-THE-SPOT" POWER WHEN YOU NEED IT

These "vest pocket" auxiliary power plants are operated by a large refining company. Such plants, comprising a diesel engine and a 100 kw E-M "Packaged" Generator, produce high-quality voltage right on the spot, for needs such as lighting, controls, communications, and even large pump motor starting and operation.

E-M "Packaged" Generators supply constant voltage automatically...dependably

● Simple, trouble-free, and dependable ... these E-M "packaged" units are *complete*. Generator, exciter, control, and all necessary components are integrated into one compact housing, ready to install and easy to connect. And no special switchboards or operating skills required!

Built-in voltage regulators assure a steady output whether generators are operated singly or in parallel. When load varies, voltage output is quickly returned to desired level.



Form S "Packaged" Generator by E-M, with direct-connected exciter. Factory assembled. Many other types available to fit desired engine design.

Sturdy E-M construction plus a minimum of moving parts gives you long service with only routine maintenance. Ratings to 187 kva, in speeds of 900 to 1800 rpm. Ask your nearest E-M sales engineer for more facts, and write for publications listed below.

ELECTRIC MACHINERY MFG. CO.
MINNEAPOLIS 13, MINNESOTA

Send for these informative brochures:

☐ "The A-B-C's of 'Packaged' Generators"
☐ E-M Synchronizer No. 35, Generator Issue
(2100-TPA-2147)

Three New Bulletins

The Leach Corporation has announced the availability of three new 2-color bulletins describing their new load sensitive electro-mechanical governor, a new type of voltage regulator for 400 cycle ac. machines and a new voltage regulator for 60 cycle alternators.

The new load sensitive electro-mechanical governor, described in Bulletin T-8500, is designated the DUPY.

It is of extremely simple construction and operation. It is used to control the frequency of an engine driven ac. alternator and the voltage or current of a dc. machine by controlling the speed of the prime mover. The bulletin gives construction features, operating characteristics, models and applications.

The voltage regulator for 400 cycle ac. machines is described in Bulletin T-8400. This all static voltage regulator is designated the INET RX400. It is designed with no tubes or moving parts. This unit is constructed of long life magnetic amplifiers, rectifiers, resistors, etc. The bulletin also includes photographs of oscillograms showing voltage recovery and stability; output voltage wave form.

The final Bulletin No. T-8300 describes the all static voltage regulator for 60 cycle ac. alternators and is designated the INET RX60. Like the INET RX400, it has no moving parts or tubes. It is designed for use with any type of 60-cycle alternator in ratings from 1 kva. to upwards of 5000 kva. and offers regulation of plus or minus ½ per cent.

Any or all of these bulletins are available free of charge by writing to the INET Division of Leach Corporation, 4441 Santa Fe Ave., Los Angeles 58, California.

New Portland Manager

C. H. Caudy has been appointed manager of the Portland, Ore., branch of the engine division of National Supply Co. He succeeds A. C. Fries, who has retired after 25 years service. The branch sells Superior and Atlas diesel engines, made by National Supply, and Chrysler marine and industrial engines.

Mr. Caudy has long been associated with the Portland branch as a sales engineer. Walter C. Severin, Jr., sales engineer, and W. E. Gebhart, in sales and service, will continue their capacities under the new branch manager.

Pump Station Contract

Col. H. W. Schull, Jr., district engineer of the Corps of Engineers, Jacksonville, Fla., has announced that Fairbanks, Morse & Co. was awarded the contract for the pumps and diesel engines to be installed in a pump station designated as S2, under the Central and South Florida Flood Control Project. Cost will be $781,102. The station will be built in the Lake Okeechobee levee at the junction of the Hillsboro and North New River Canals. The site is just south of hurricane gate structure No. 4 near Belle Glade.

Four model 38D8⅛ Fairbanks-Morse opposed-piston type diesel engines, each rated at 1280 hp. and driven through right angle gears to four Fairbanks-Morse model 6310 vertical propeller pumps with 144-in. propellers, will be used. The station will have a pumping capacity of over 1,600,000 gallons per minute. The structure will cost $1,191,988 and the contract was awarded to Belcher Oil Co. of Miami, which also holds a Corps of Engineers contract for construction of pump station S5A on the West Palm Beach Canal.

Recent Promotions Announced

F. H. Mott, administrative vice president of Eaton Manufacturing Co., has announced recent promotions in the firm's Saginaw division as follows: Vincent Ayres to chief engineer, G. D. Line to assistant chief engineer and P. J. D'Arcy to assistant to the sales manager.

Mr. Ayres joined Eaton in 1937. He holds two degrees from Wayne University, is a charter member of the Engineering Society of Detroit and also holds membership in SAE and Tau Beta Pi. Mr. Line also joined Eaton in 1937. He is a mechanical engineering graduate of Purdue University and formerly was customer contact engineer for the Saginaw and valve divisions. Mr. D'Arcy formerly was a sales representative for the division and has been in the sales department since 1947.

Florida Pump Station Ready

The Davie agricultural area of southern Florida, which has suffered heavily every wet season, is now afforded relief by completion of the installation of three General Motors 6-110 diesel engines, each rated 175 hp. at 1200 rpm., driving three Philadelphia Gear Works pumps, type V.B.H.X. rated at 8000 gpm. Pump Station No. 13 is located on the South New River Canal. A test run by Ellis Diesel Service of Ft. Lauderdale was made when hurricane "Edna" threatened southern Florida. Col. H. W. Schull, Jr., Jacksonville district engineer of the Army Corps of Engineers, reports that all three pumps can now be used if needed should a hurricane or flood occur in the area.

W.G.B. GIVES YOU A FULL SIZE 750 CUBIC INCH OIL FILTER

One-piece, aircraft-type ring clamp holds top securely. No nuts or bolts to lose or bother with.

Amazing . . . New
750 CUBIC INCH W.G.B. OIL FILTER
uses FULL SIZE (8 x 15) cartridge that can be changed in 3 minutes WITHOUT TOOLS

● **YOU GET** a *full size* 750 cubic inch oil filter when you use W. G. B.--because it's made big enough to use a *full size* (8 x 15) S-11C cartridge. That's why W. G. B. thoroughly cleans more oil faster--and keeps its color clear longer.

● **NO NUTS AND BOLTS**--the new W. G. B. Model WD-2-750 cubic inch Clar-O-fier uses a top that's held securely by a clamp, equipped with a *single hand tightening device*.

● **NO LEAKAGE**--an "O" ring gasket keeps the oil completely locked-in under any operating pressure.

● **QUICKLY INSTALLED**--in most instances fits into the brackets used for any 750 cubic inch filter.

● **FOR BEST RESULTS**--use only the genuine W. G. B. Clar-O-fex Replacement Cartridge (No. S-11C).

APPROVED BY LEADING ENGINE MAKERS

● **REMEMBER W. G. B.** has not--and will not--reduce the size of its S-11C (8 x 15) cartridge. Specify the W. G. B. S-11BC cartridge for *smaller size*, so-called 750 cubic inch oil filters.

● **W. G. B. MAKES REPLACEMENT CARTRIDGES FOR ALL POPULAR MAKES OF FILTERS.**

● **SPECIFY W. G. B. AS ORIGINAL EQUIPMENT — OR ORDER FOR REPLACEMENT.**

WRITE FOR COMPLETE DETAILS AND NAME OF NEAREST DISTRIBUTOR

W.G.B. OIL CLARIFIER CORP. KINGSTON, NEW YORK

New Type Engine Starter

A new type of diesel and gasoline starting fluid applicator which automatically meters the proper amount of starting fluid to the engine has been placed on the market by Sinclair Refining Co. and Automotive and Marine Products Corp. Known as the Ampco-Sinclair engine starter, the device was developed by Sinclair Research Laboratories, Inc., in conjunction with Ampco and is being manufactured by Ampco.

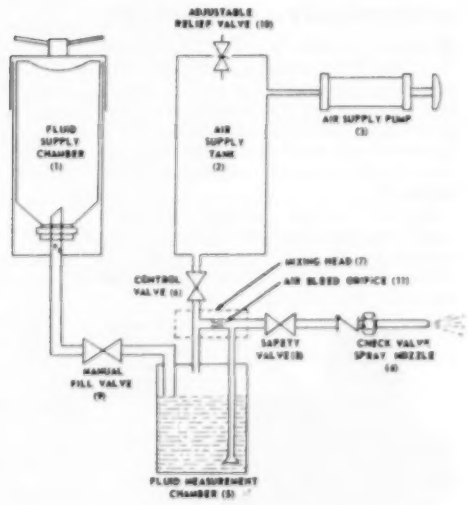
The engine starter provides automatically the proper amount of fast-igniting engine starting fluid needed to begin normal fuel firing when diesel engines are cold. When a diesel engine must be stored and started at low temperatures, a quick injection of a fast-igniting fluid is necessary to aid starting and sustain combustion until the regular fuel maintains engine operation. It is claimed that even an inexperienced operator can use the Ampco-Sinclair starter, regardless of engine design, size or temperature conditions.

In special cold room tests at the Sinclair laboratories at Harvey, Ill., the new unit provided rapid engine firing at temperatures down to –40°F. The starter now on the market was preceded by 14 different experimental and service test models and represents six years of work by Sinclair Research and Ampco. The unit utilizes the aerosol principle, as opposed to solid starting fluid injection. It has a closed, pressurized circuit to eliminate fumes and fire hazards. Controls can be easily manipulated with gloved hands.

Ampco-Sinclair engine starter unit (at right) with General Motors engine. The starter is designed for both diesel and gasoline engines.

The starter is designed to receive a sealed can of starting fluid to eliminate pouring and is rated to provide up to 60 individual starts with a 10-ounce can of starting fluid. Although designed for Sinclair starting fluid, others can be used.

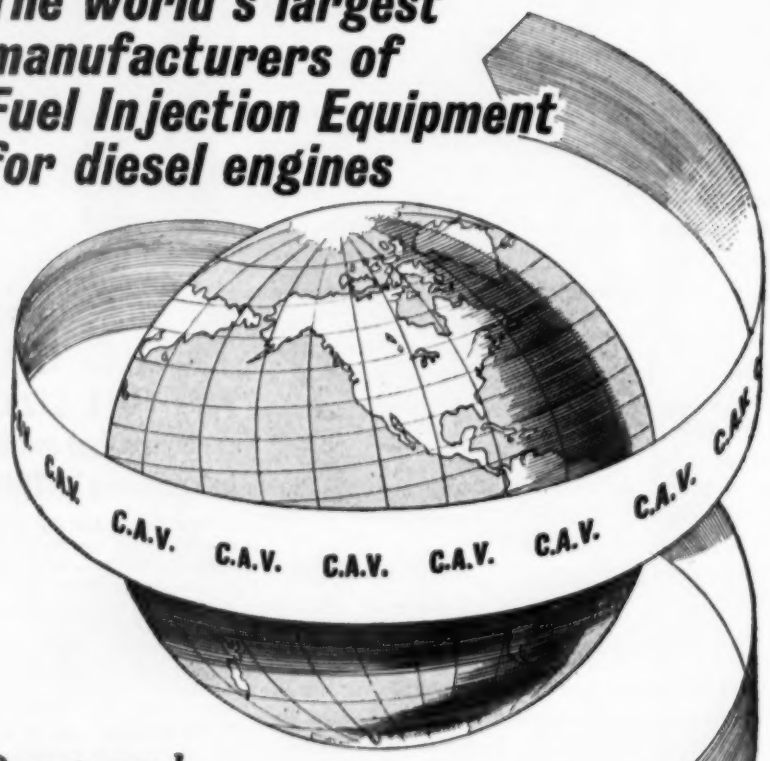
According to the manufacturer, the new engine starter does not require "operator know-how" because the technique of starting is built into the unit. Inquiries and requests for additional information on the Ampco-Sinclair engine starter should be addressed to DIESEL PROGRESS, File No. 118, Box 8458, Cole Station, Los Angeles, 46, California.



This schematic drawing of new Ampco-Sinclair engine starter shows basic parts of the unit. Here is how the starter operates: The fluid supply chamber is filled with starting fluid, the fluid measurement chamber is filled by opening the manual fill valve and the air supply tank is pressurized by the air supply pump to a predetermined pressure. Pressure in the tank is controlled by setting the adjustable relief valve. The unit is now primed for engine starting. The safety valve is opened next, and with the engine fuel throttle in run position the engine is cranked and the control valve opened simultaneously. When the control valve is opened, pressurized air from the air supply tank enters the mixing head and continues through an air line to the fluid measurement chamber, forcing starting fluid to the "downstream" side of the mixing head. Before injection into the engine, the fluid is mixed with air passing through the air bleed orifice from the air supply tank. Upon starting of the engine, the control valve is closed.

C.A.V.

The world's largest manufacturers of Fuel Injection Equipment for diesel engines



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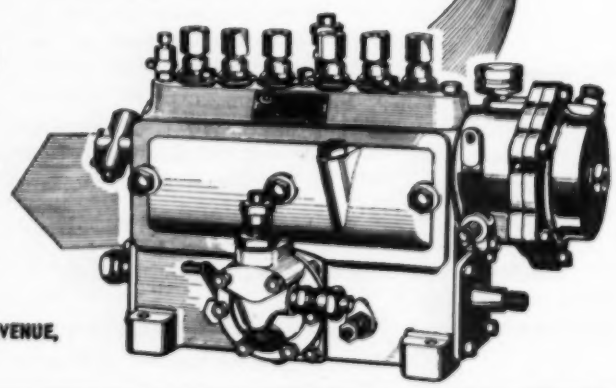

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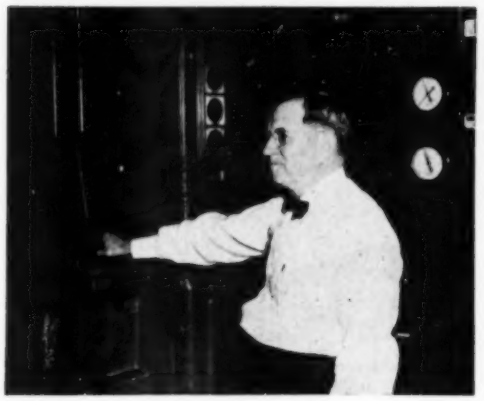
C.A.V. **Fuel Injection and Electrical Equipment**

Hillsdale Power Plant Addition



Hillsdale Mayor George Convis at the throttle of the city's new Nordberg unit.

A 3-day open house and housewarming program marked the recent addition of a new Nordberg 4200 bhp. diesel unit to the municipal power plant at Hillsdale, Mich. The city's latest diesel installation was the culmination of nearly two years of work in expanding one of the state's outstanding municipal light and power plants, an operation that combines diesel and steam power generating facilities.

Hillsdale first augmented its steam plant capacity by installing a 2250 bhp. Nordberg air injection unit as a standby reserve in September, 1938. In 1946 a 3600 bhp. solid injection unit

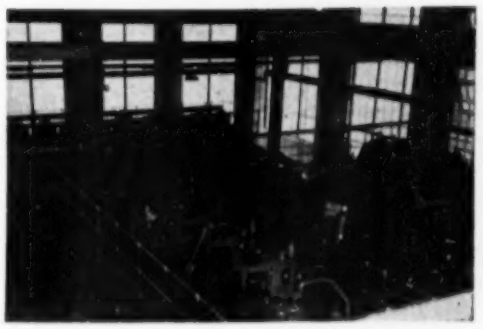
Superintendent R. L. Gregory synchronizes new Nordberg with Hillsdale power plant system.

was installed. Following an engineering survey after the outbreak of the war in Korea, the city decided to add to its plant and install more diesel capacity. The project was approved in 1951.

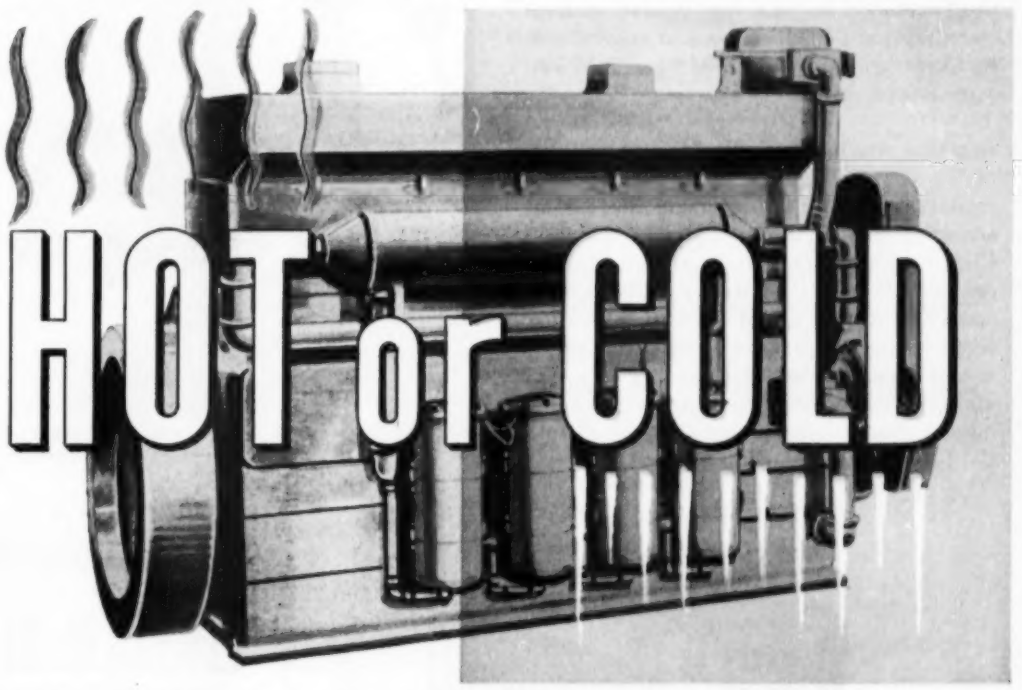
When installation of the new Nordberg 4200 bhp. unit was made recently several of the vendors and companies connected with the project sponsored a banquet and evening program carried out under the direction of city officials.

Mayor George Convis headed guest and program details and Miss Emma Hellar supervised the floral arrangements. Fredrick Marshall, district state representative, acted as toastmaster.

Among the speakers were Claude Porter, mayor of Adrian; State Senator Haskel Nichols; J. B. Sims, president, and Gilbert Chevanelle, secretary, Michigan Municipal Utilities Association; C. F. Cook, president of the Hillsdale Board of Public Works; Lawrence Peterson, representing a delegation from Nordberg Manufacturing Co.; Rusk Potter of the Allis-Chalmers delegation attending the event; Earl Weeber and Dorance McCrady of the engineering firm of Hamilton, Weeber & Ward; and Theo. Busching, president of the Mid-State Construction Co., Fort Wayne, Ind.



Three Nordberg diesels in the Michigan plant include 2250 bhp. unit in foreground, 3600 bhp. unit at right and new 4200 bhp. diesel in plant addition at rear. Three-day open house marked addition of newest unit.



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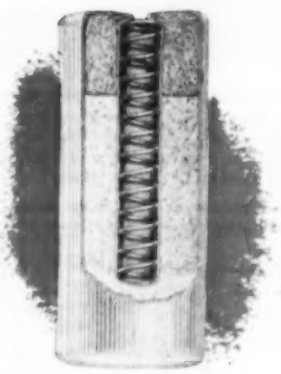


CP* Controlled Pressure elements are the subject of an interesting and helpful booklet, that can save you money. Write for your copy today — it's free, of course.

You know that engines are completely protected only if the lube oil is filtered under *all* conditions. It is essential that dangerous particles be removed when the oil is cold and viscous, just as it is under normal operating temperatures. When you have less than full-flow filtration, you may not be protecting critical surfaces, if a part fails or if oil is contaminated at the start, because the oil is by-passed around the filter element.

In a Winslow CP* element, cold oil *immediately* flows through the coarser section of filter material, which accepts the oil and removes all critical particles. As the temperature rises, more of the oil flows through the dense section of the element, assuring complete filtration at all times. The proportion of coarse and dense filtering media has been determined by laboratory research and field testing for each size of filter, and is an exclusive design feature of Winslow CP elements.

Winslow filters are your assurance of longer oil life and maximum engine protection under all operating conditions.

WINSLOW FILTERS

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

Clark Equipment Co. Acquires Torque Converter Business

Clark Equipment Co. of Buchanan, Mich., a leading supplier of automotive components, industrial materials handling trucks and construction equipment, has announced the acquisition of inventories, engineering designs and products, tooling, trademarks and patents and certain other assets of the Torcon Corp. of Ashtabula, Ohio, a producer of torque converters.

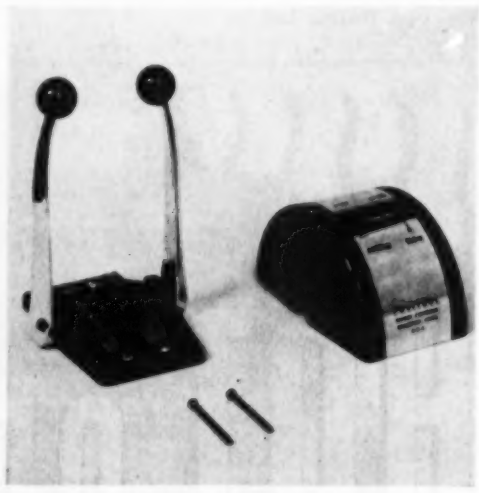
The transaction will enable Clark Equipment Co. to offer one of the broadest lines of torque converters and transmissions available from a single source, according to the company. Principal customers for this type product include manufacturers of automotive and construction equipment and equipment used for oil field and logging applications.

In taking over inventories and business-in-hand of Torcon, Clark is not purchasing Torcon's capital stock nor is Clark assuming its liabilities, according to C. H. King, Clark vice president. Clark is not acquiring Torcon's plant facilities at Ashtabula or its basic machine tools. Production operations for the manufacture of the torque converters will be transferred to Clark's transmission plant at Jackson, Mich., under the supervision of Roy McDermott, manager of the transmission division. A number of key personnel from the Torcon organization have joined Clark.

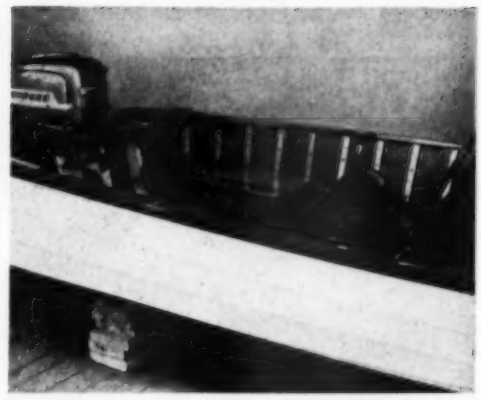
Clutch-Throttle Control

A new combination clutch-throttle control being marketed under the Positrol trade name is in production by Panish Controls, Bridgeport, Conn. The control is 100% mechanical and is used on all engines equipped with hydraulic reverse gears of any make. For diesel installations, the unit includes throttle brake and diesel stop.

Clutch and throttle control are combined in a single unit with the Panish interlock preventing any maneuvers damaging to engines or gears.



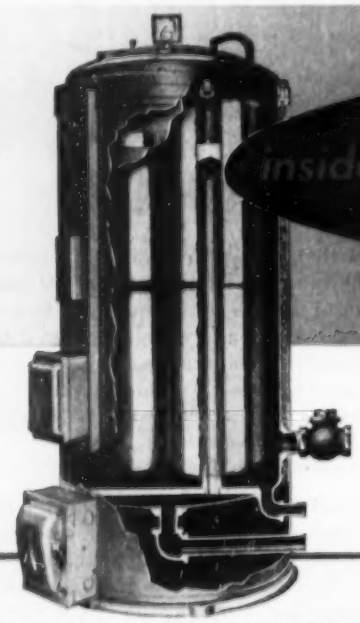
Panish Positrol, model A-1750, with cover removed to show accessibility of mechanism for installation and service.



New Panish combination clutch-throttle control installed on outboard runabout.

A 30-minute installation kit for the GM 71 series marine diesels reduces over-all installation labor and material to a minimum. Removing the cover of the pilot house control unit exposes the entire mechanism for installation, cable attachment, brake adjustment, testing and maintenance. The push-pull cable movement for both clutch and throttle is reversible at the control. Two-point (bridge and pilot house) control can be made at any time. The control is sturdily built, fully non-magnetic and weighs 6.5 lbs.

Additional information may be obtained by writing to Panish Controls at 191-203 Bennett St., Bridgeport 5, Conn. The manufacturer points out that the control is low in cost and easy to install.



inside tip

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The Honan-Crane "Multi-Cartridge" Purifier is engineered, inside and out, to provide the high-flow, *thorough* oil purification essential for diesels. Removes *all types* of harmful contamination . . . substantially reduces engine wear and maintenance costs . . . quickly pays for itself in oil savings alone!

Here are a few of the time-tested features that make Honan-Crane *preferred for safety and savings* wherever diesels are used »»

1. Cartridges are readily interchangeable to provide type and degree of purification required.
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3. Cartridge design prevents channeling or by-passing. Multiple units provide high flow rate.
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5. Oil-and-gas-tight seals and gaskets prevent seepage. Dirty oil cannot contaminate clean oil.
6. Double-decked cartridges save floor space, permit clean design, greater operating efficiency.
7. Positive locks and pressure springs keep cartridges securely in place, prevent by-passing.
8. Purifier is fully equipped with automatic controls and safety features. Requires no attention.

INTERCHANGEABLE CARTRIDGES FOR HONAN-CRANE PURIFIER

TYPE "MC" — Cotton bag packed with Cronite (fuller's earth). Removes solids and products of oxidation . . . acids, gums, etc. Provides refinery-type purification.

TYPE "MF" — Perforated metal basket packed with Palconia (cellulose fiber). Recommended for additive oils for complete removal of dirt, scale and other solids.

TYPE "S" — Contains Palconia (cellulose fiber). Performs same as Type "MF." Fiber center-tube permits complete disposal of spent cartridge by burning.

TYPE "E" — Similar to Type "S" except that filtering material is cotton waste and excelsior. Type "E" is recommended when water is encountered in the oil.

WRITE US ABOUT YOUR OIL PURIFICATION PROBLEM

Honan-Crane Fuel and Lube Oil Purifiers are available for any size or make of Diesel Engine. For detailed information, write Honan-Crane giving make, model and H.P. of your diesel. Describe any unusual aspects of your oil purification problem.

HONAN-CRANE CORPORATION

202 Indianapolis Avenue, Lebanon, Indiana

A Subsidiary of

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New Orleans Diesel News

By James W. Calvert

A 12-IN. centrifugal pump driven by a 5-cylinder Fairbanks-Morse model 38-F5½ opposed-piston diesel engine rated at 375 hp. has been sold by Fairbanks, Morse & Co. in New Orleans to Keller Construction Corp. for installation in the new plant of East Jefferson Water District No. 1, Jefferson Parish, Louisiana. The unit will be used for standby in case of power failure.

NEARING COMPLETION at the Pelican Marine and Iron Works in Houma, La., is a 65-ft. tug being built for Dick Jones of Houma by Mechanical Equipment Co., New Orleans. The tug *Shirley Jones* is powered with twin Buda diesel engines, model 2505, developing 400 hp. at 1300 rpm. The vessel also is equipped with two 16 kw. Buda light plants and the Meco hydraulic steering system, radar, shipshore radio and full pilot house control. The tug will be used for shifting barges and rigs in oil fields of the southern Louisiana marshes.

J. RAY McDERMOTT of Harvey, La., has purchased from Reagan Equipment Co., New Orleans, two 200 kw., 900 rpm. Electric Machinery generator sets to be driven by two Waukesha model LRDBS turbocharged diesel engines.

TWIN BUDA diesel engines, model 2505, are being installed in Coyle Lines' new pusher-type towboat nearing completion at Lockport Shipyard, Lockport, La. The engines, rated 400 hp. at 1300 rpm., and two 16 kw. Buda light plants were sold by Mechanical Equipment Co., New Orleans. The towboat also is being equipped with a Meco hydraulic steering system, developed by Mechanical Equipment. The vessel has two backing rudders, located just forward of the propellers, as well as the standard steering rudders. Coyle will use the tug in Intracoastal Canal traffic.

THE *Meco Driller*, 65-ft. offshore crew boat with a capacity of transporting 40 passengers at 18 mph., has just been completed at the Sewart Seacraft, Inc., shipyard at Patterson, La., and has joined the Shell Oil Co. fleet attached to the ODECO submersible drilling barge *Mr. Charlie*. The crew boat is powered with a turbocharged Buda diesel model 8-DATMR-1125 with a maximum 385 hp., although rated 300 hp. at 1900 rpm. for continuous operation. The boat also has two 7½ kw. Buda generator sets. Mechanical Equipment Co., New Orleans, installed the machinery. *Meco Driller* is based at Venice and is used to transport drilling crews to the offshore mobile rig now operating in West Bay.

BLUE PLATE FOODS is now operating a White 22-PLTD with a Waukesha model 135 DKBS, turbocharged diesel engine. Installation was made by Reagan Equipment Co., New Orleans, Waukesha distributor for eastern Louisiana, Mississippi, Alabama and northwest Florida.

THREE 65-FT. offshore crew boats, powered with Buda diesel engines model 8-DATMR-1125 sold by Mechanical Equipment Co., New Orleans, have just been delivered to Magnolia Petroleum Co. Two of the vessels, *E. C. Seymour* and *H. C. Cortes*, are operating out of Morgan City, La., to Magnolia offshore rigs in the Gulf of Mexico, and the *R. M. Chan* is based at Sabine Pass.

TWO 36-FT. shallow draft gage boats, powered with Buda diesel engines model 273 installed by Mechanical Equipment Co., New Orleans, are being built for Shell Oil Co. by Sewart Seacraft, Inc., at Patterson, La. The boats will be used by well gagers in producing oil fields of the Louisiana marshlands.

THE 65-FT. shrimp trawler *Black Orchid*, equipped with a Buda diesel engine model 6-DASMR-844 rated at 280 hp., has just been delivered to Robert Guidry of Golden Meadow, La., by Mechanical Equipment Co., New Orleans. The trawler was built at the shipyard of Clayo Adams in Cutoff, La., and is now fishing in the Gulf of Mexico off Grand Isle. The trawler has 4:1 reduction gear, swings a 44 by 36-in. 4-blade propeller, and has Morse single lever pilot house control.

PITRE & GUIDRY Boat Co. has bought through Reagan Equipment Co., New Orleans, a Waukesha model WAKDM 240 hp. marine diesel for the 67-ft. fishing trawler *Miss Emily*.

A NEW TYPE of offshore crew boat, designed jointly by John Pottharst of Mechanical Equipment Co., New Orleans, and Ken Kidalgo of Sewart Seacraft, Inc., Patterson, La., is being built at the Sewart shipyard and is expected to be the fastest yet developed for Louisiana's offshore oil industry. The boat, as yet unnamed, will be equipped with twin Buda diesel engines model 1125 and two 7½ kw. Buda generator sets. The designers anticipate the crew boat will operate at 20 mph.

EQUITABLE Equipment Co., New Orleans, has added to its line of steel crew boats with the completion of the *Erline*, a 51-ft. water taxi just delivered to the Robin Boat Rental Service of Harvey, La. She will be used for transporting crews to offshore drilling locations. The boat is powered with two GM 6-cylinder, 2-cycle marine diesel engines of the 110 series, developing a maximum of 300 hp. each at 2100 rpm.

THE NEWEST ocean drilling rig to go into service in Louisiana's offshore oil fields is the completely dieselized, mobile submersible unit of Kerr-McGee Oil Industries, Inc., which was christened recently at Ingalls Shipbuilding Corp., Pascagoula, Miss. Designed to operate in water up to 40 ft. deep, the rig consists of a barge 140 by 72 by 13 ft., which supports a drilling platform and an entirely self-contained superstructure with living quarters and material storage facilities. The main deck level is 73 ft. above the ocean floor when the unit is submerged. This structure, which has been compared in size to a 9-story office building, gets its drilling power from four sets of twin 500 hp. GM diesel engines transmitted through a compound and one 300 hp. GM diesel engine driving the rotary unit: Electric power is supplied by two 200 kw. Caterpillar diesel generators.

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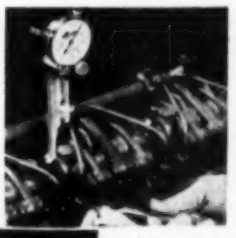
TO ▸ SET VALVE GAP ▸ TIME FUEL INJECTORS ▸ BALANCE FUEL RACKS
with Micrometer Accuracy

This new precision instrument utilizes an entirely new principle in adjusting valve clearance, timing injectors and balancing fuel racks.



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- Easy, fast, accurate for mechanics, operators, owners.
- Eliminates inaccuracies of individual "feel".
- Both hands are FREE to make adjustments while dial indicator registers exact settings.
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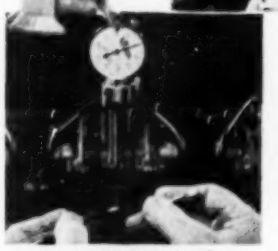

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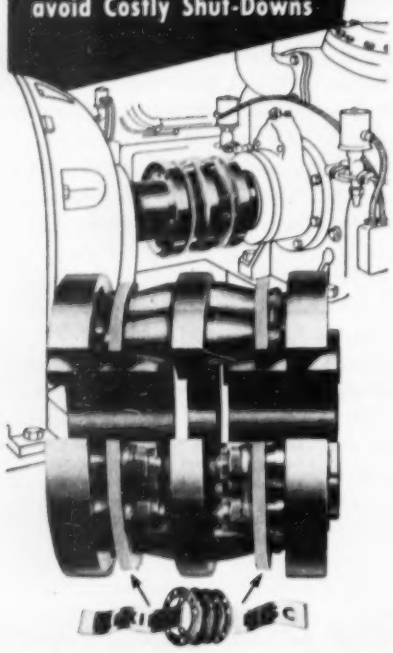
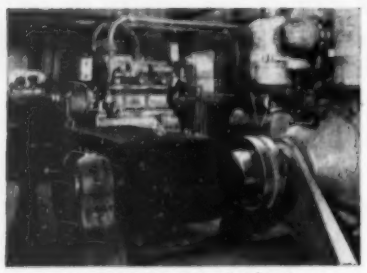


Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



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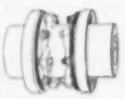

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Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

Amot Model D 3-Way Valve

The new Amot model D 3-way thermostatically operated valve was developed by Amot Controls Corp. of Richmond, Calif., as a result of the demand from the diesel and gas engine industry for a thermostatic control for jacket water in a pipe size larger than six inches. Prior to this development, a 3-way thermostatically operated valve designed specifically for engine control had not been available, and specification engineers had to use expensive, makeshift equipment.

In large stations, such as gas pumping stations, it has been advantageous because of cost and other factors to install what is known as a common header type cooling system for engines in which each engine jacket water outlet discharges into a common pipe. This pipe, or header, is then discharged into a large heat exchanger or cooling tower. Because the heat exchanger or cooling tower must have sufficient capacity to take care of cooling requirements at peak loads and on the hottest days, the engine jackets tend to run too cold under normal operating conditions. This condition is corrected by installation of the Amot model D 3-way valve as shown in Fig. 2.

In Fig. 2, when the jacket water is cold, connection "B" will be completely open so that all water received at "A" is discharged into by-pass line "B." In this manner the heat exchanger is bypassed until the water reaches desired temperature. At this point, connection "B" starts to close off, and at the same time connection "C" starts to open. Connection "A" is open at all times. The positioner, which is built into the valve, will position the internal sliding valve so that the amounts of water emerging from "B" and "C" will be in the correct proportion so as to maintain the correct temperature of the water emerging from the engine jackets.

Construction of the Amot model D valve is shown in Fig. 1. To operate the valve, an external source of air at 20 psi. or higher is required. A pneumatic controller is mounted with the thermostatic bulb at the point at which the

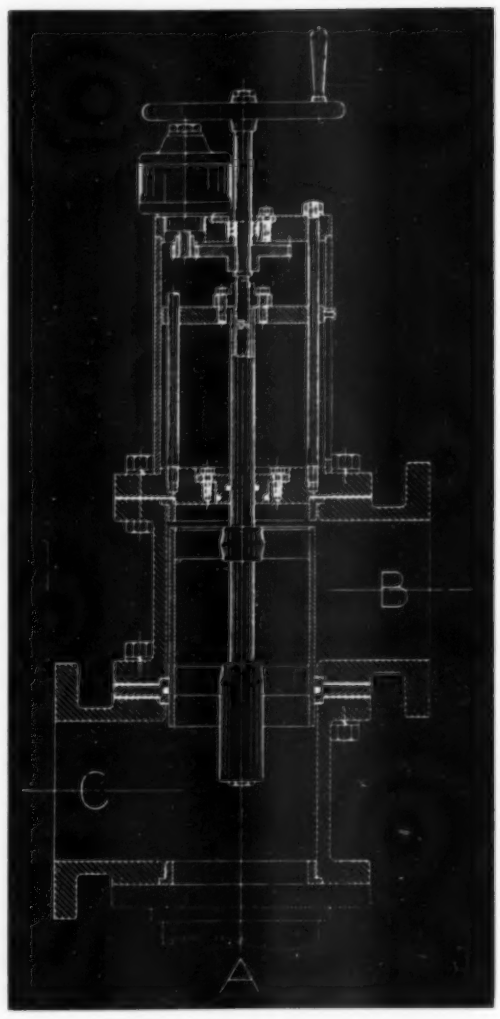


Fig. 1—Amot model D 3-way valve.

temperature is to be maintained. This is usually in the line going to the "A" connection. With an increase in temperature, there is a corresponding change in the pressure released by the controller to the operating mechanism, which starts the air motor and causes the sliding valve to move upward—closing off the "B" opening. As opening "B" closes, opening "C" will open up. Modulat-

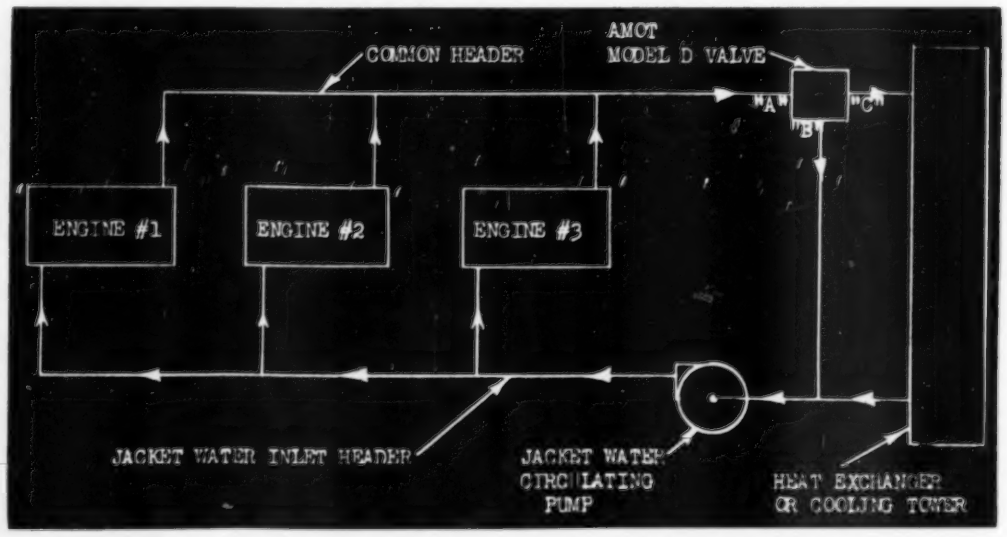


Fig. 2—Engine jacket water system diagram using Amot model D 3-way valve and common header.

ing action is given by this valve as a valve positioning mechanism is built into the control to assure that there is a definite sliding valve position corresponding to every temperature sensed by the control bulb at any instant.

The valve is constructed of cast iron, bronze fitted. Ball and roller bearings are used wherever possible. "O" rings are used for packings, and packing adjustments are not necessary because of the absence of stuffing boxes. The use of a motor and screw mechanism to operate the sliding valve instead of a diaphragm type motor insures that the sliding valve will "stay put" at any one place, thus increasing stability. The sensitivity of the control is adjustable so the operator can have the valve operate over a wide or small range. Although the valve will operate with any type of controller that varies the air pressure from 5 to 15 psi., the control unit is normally supplied with the valve when temperature control is desired. Pipe sizes that normally would apply to the engine applications mentioned above would be 8, 10 and 12-in. sizes. However, Amot is listing sizes up to 36 in.

Filter Features Quick Installation

Equipped with a single tightening device, the new W.G.B. model WD-2 Clar-O-fier has a top held securely by a clamp. The oil clarifier has no nuts or bolts, is quickly installed and fits into the brackets used for most 750 cu. in. filters. An "O" ring gasket keeps the oil locked in under any operating pressure, according to the manufacturer, and cartridges can be changed in three minutes. The company recommends use of the W.G.B. Clar-O-fex replacement cartridge with the new filter.

Further information may be obtained by writing to W.G.B. Oil Clarifier, Inc., Kingston, N. Y.

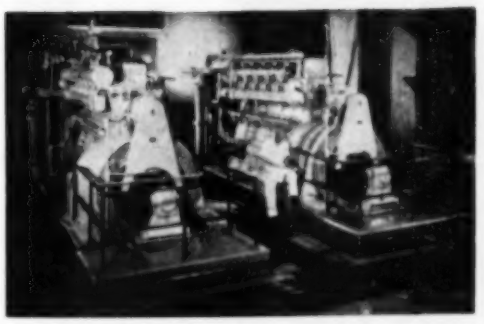
General Manager Appointed

F. F. Hinkley

Aeroquip Corp. of Jackson, Mich., has appointed Forrest F. Hinkley general manager of Aero-Coupling Corp., an Aeroquip subsidiary at Burbank, Calif. Mr. Hinkley will be responsible for all sales and manufacturing functions of the subsidiary. Formerly director of subsidiary operations at Aeroquip's Jackson plant, Mr. Hinkley has been a corporation executive for the past 11 years. He started his career with the King-Seeley Corp. and later became chief of standards for Hancock Manufacturing Co. He joined Aeroquip as assistant factory superintendent in 1943. Aero-Coupling Corp. serves the West Coast market for aircraft and industrial hose, fittings and self-sealing couplings.

'What Chromium Is Doing'

"Here's What Chromium Is Doing," a new bulletin published by the Chromium Corp. of America, relates to the performance and reclamation of chromium plated diesel engine cylinder liners. Industrial chromium plating, when made oil-retentive, provides an ideal surface to withstand abrasion and corrosion that are inherent in the operation of diesel engines, the bulletin points out. Although it deals primarily with engines for railroads, the publication applies equally to diesel engines for all types of service. Copies of "Here's What Chromium Is Doing" may be obtained by writing to Chromium Corp. of America, 100 E. 42nd St., New York 17.



POWER FOR PLANT—Electric power for Tampa's newest sewage treatment plant—Florida's largest—is supplied by two Worthington engines driving Electric Machinery Co. generators. Both engines operate on sewage gas produced during treatment of the raw sewage. Tampa's population has almost doubled since 1947.

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Easily installed for immediate use. Mount with four hold-down bolts . . . and you're ready to operate.

Harbormaster Outboard Propulsion and Steering Units are complete marine power packages, *ready for immediate use. Everything is included* . . . fuel tank, battery, steering mechanism, even the hold-down bolts. Mount; put in fuel; start; and you're off with exceptional power and maneuverability. Harbormasters give you special features not found with ordinary marine power. They are the outstanding and practical choice for jobs where you want an easily installed marine power unit you can depend on.

- **Steers instantly in any direction with full power**
  Exclusive patented M&T 360° Propeller Thrust Steering Control gives you the ultimate in maneuverability.
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  Special 180° elevating mechanism allows one-man operator to raise entire submerged assembly to any degree he desires. No dry docking or diving for repairs necessary.
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- **Economical to operate and maintain**
  You realize savings in fuel expense because you get *more thrust per horsepower* with outboard propulsion. Harbormasters give you rugged, dependable operation with a practical minimum of maintenance and service.

Specifications:
Sizes available from 20 to 300 h.p., gas or diesel power. Model 0-41H (illustrated).

Engine H.P.	50
Engine R.P.M.	2300
Propeller diameter	30"
Propeller pitch	15"
Propeller R.P.M.	608
Fuel tank	16 gallons
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Width	35½"
Weight (dry)	2780 lbs.

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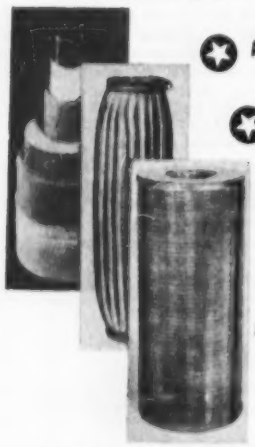

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Inland River Reports

By David I. Day

CAPT. GRADY WELCH had the *Jeannette-E* at the Greenville, Miss., landing as we passed through this historic old southern town. She had two barges of oil from Texas for the Republic Oil Co. She was built at the Vance yards in Houston some 10 years ago and her 800 hp. Enterprise engine has given her a fine name.

IT WAS A PLEASURE also to see our old favorite tug, the *Gloria Colle*. She has a 1000 hp. Enterprise diesel unit. Capt. Allen Mason was in the pilot house and had two barges of oil for the Texas Co.

THE *L. Wade Childress* of the Mississippi Valley Barge Line was coming up some miles above Memphis with the biggest tow we saw—some 24 barges for Cairo, Ill. Her General Motors twins give her 3000 hp.

ANOTHER MVBL boat, the *New Orleans*, once called the *Herbert Hoover*, 3200 hp. with General Motors twins, made an impressive sight back of 17 barges in charge of Capt. Roy J. Clay.

CALVIN WIRTHWEIN, a young North Carolina free-lance photographer has been taking pictures on both sides of the Mississippi below Memphis. One of the pictures he hoped for was to catch the *Childress* in line with the old towns of Prentiss, Miss., and Napoleon, Ark., both towns long ago submerged by the Mississippi but now being uncovered by low water. Mr. Wirthwein had a fine picture of the *Cherrystone*, one of the Nashville Bridge Co. boats with General Motors twins, 1800 hp.

WE GOT OUR first good look at the tug *Kate Malloy*, operated by the Anderson Petroleum & Transport Co., Houston. She is well-known on the canal to Texas and has been active a couple of years. She has a General Motors engine 900 hp.

WHILE LOW WATER plagued the pilots on the lower Mississippi heavy rains had the upper river very rapidly rising and some of the locks suspended indefinitely. The situation got under control and boats resumed traffic. We drove up some 100 miles above St. Louis, noting three boats of interest: the *Coal King* with a coal tow, her twin GM units working smoothly; the *Laguna*, headed for St. Paul—a lovely towboat with GM diesels; and the *Alice Ingram*, moving very fast down stream. She uses GM engines also, about 1400 hp.

WM. McANALLY, chief engineer on the *Helena* of the Federal Barge Line, is said to like her General Motors engines. We recall this boat when she was a steamer using triple-expansion condensing steam engines. Bill was serving extra, it was said in St. Louis, the regular chief being off on days. He is Murray Clements.

FROM MRS. B. J. KAISER, Pittsburgh, we

How much of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?*

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

Cylinder Overload **Preignition**
Scaled Jackets **Clogged Ports**
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have a photo of the *City of Maysville,* owned by the Triangle Towing Co., Maysville, Ky. She has Superior engines of about 800 hp. This boat was originally the steamer *Tallulah* but under diesel dispensation has been called the *Walter F. Carey, Commercial Dixie,* and *Commercial Tennesseean.* We have pictures under all five.

TWO LETTERS this month complimented the *Arkwright* of the Pittsburgh Consolidated Coal Co. for fine work economically performed. She has twin Superiors, 1066 hp. She is Dravo-built.

CAPT. JOHN M. HYSMITH is still doing fine work with his towboat *Sewickley* on the upper Ohio. The boat, rated at 200 hp., is Dravo-built, using Cooper-Bessemer engine. Captain Hysmith is the only active riverman we know who is a minister in the Spiritualist Church.

A LETTER STATES that John McNierney and Leslie Hoffman, engineers on the *C. F. Hood* of the U. S. Steel fleet, Pittsburgh, "are very high" on the engine room there. The boat is doing fine work. The engines are F-M twins, 1280 hp.

THE M/V *South Wind* and the M/V *North Wind,* both formerly belonging to the Commerce Lines, Inc., are docked at Whitehall, Mich., on Lake Michigan to be sold. Both are powered by a 900 hp. General Motors diesel. The auxiliaries on each consist of one 100 kw. Superior diesel and two 10 kw. Hill diesels. We remember the *South Wind* particularly as a steamer of 1892 converted to diesel in 1949.

WHEN IN NEW YORK a year ago we understood the tug *Russell 17,* propelled by a General Motors engine, diesel-electric, 1200 bhp., would be in and around Detroit. This is, however, not the case. She is still in the oil and gasoline trade between Eastport, Maine, and Jacksonville, Fla. She is owned by the Russell Bros. Towing Co.

ONE OF THE truly fine tugs on the Great Lakes is the *S. M. Dean* of the Pringle Barge Line Co., Detroit. She tows the barge *Constitution* in the bulk coal trade between Toledo, Ohio, and the Detroit River docks. The main engine is a 1600 hp. Fairbanks-Morse. Auxiliary power consists of two Superior 100 kw., dc. generator units and a 30 kw., dc. General Motors diesel generator. She is fast, 10½ mph., with 8½ mph. loaded.

CHIEF ENGINEER Benjamin A. Wilson of St. Ignace, Mich., is in charge of the engine room operations of the *Vacationland,* the 9300 hp. ferry belonging to the Michigan State Highway Department and in operation at the Straits of Mackinac. She is a lovely craft using twin screws at each end with power from four Nordberg diesels. She was built by the Great Lakes Engineering Works, River Rouge, Mich.

THE SOCONY-VACUUM Oil Co.'s newest Great Lakes tanker is the *Chicago Socony,* with East Chicago, Ind., as home port. Built in 1953 at the yards of Todd Shipyards Corp., she has won a reputation for efficiency second to none. Twin Superior diesel engines generate 2080 hp.

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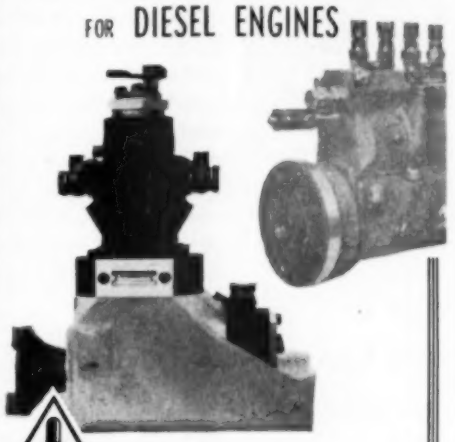

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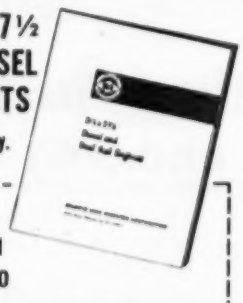

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Data on Shaft Mounted Drives

Design data, selection tables, dimensions, weights and installation photographs are included in Bulletin 7101, "All-Steel Shaft Mounted Drives," published recently by the Falk Corp., 3001 W. Canal St., Milwaukee 8. According to the manufacturer, this modern type of standard gear drive offers high ratios of speed reduction in limited space with savings in initial cost and installation expense. Copies of Bulletin 7101 may be obtained by writing to the company.

'Give Cooling System a Chance'

How important is the cooling system of an internal combustion engine? Just as important to the engine as the lubricating, fuel or air systems, according to the service division of the Cummins Engine Co., Inc., Columbus, Ind. In a new service bulletin, "Give the Cooling System a Chance," Cummins points out that it pays to keep the cooling system in good condition because neglect will result in expensive repair bills or loss of an engine. The bulletin contains practical suggestions on the best way to care for an engine cooling system. Copies of the publication may be obtained by writing to the Publications Editor, Cummins Engine Co.

Heat Exchanger Catalog

A complete description of stock and specially engineered Young Radiator Co. type "F" fixed tube bundle heat exchangers is given in the firm's newly revised Catalog No. 1254. The 12-page, 2-color catalog contains application photographs covering a wide range of industries as well as materials and construction features, dimension drawings and tables. Four pages are devoted to a guide to heat exchanger selection. Copies of Catalog No. 1254 are available by writing to Young Radiator Co., Racine, Wis.

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Mid-Continent Diesel News

By Jack F. Cozier

H. A. HANE Construction Co., Garnett, Kan., has purchased a Unit 1614 back hoe powered by a GM 2-cylinder diesel engine from the Midwestern Engine & Equipment Co., Tulsa.

GULF PIPE LINE Division, Beaumont, Texas, has purchased through the Gaso Pump & Burner Co., Tulsa, a Buda model MO-1290 gas engine for pipe line pumping.

WHITE MINING CO., Uvalde, Texas, has put into operation a 59T Euclid rear dump truck powered with a Cummins NHRS-600 engine hauling 22 yds. of rock in a quarry operation.

PANAMA WILLIAMS Pipeline Co., Houston, has bought 2 Unit 1020A back hoes equipped with 3-cylinder GM diesel engines from Midwestern Engine & Equipment Co., Tulsa.

GEORGE E. FAILING CO., Enid, Okla., has just bought a Buda HP-326 gas engine to be used on a portable rig.

WHITE MINING CO., Uvalde, has in operation a Bucyrus-Erie 54-B shovel powered by a Cummins HB-600 diesel for quarry work.

BELL ENGINE SERVICE, Great Bend, Kan., has just sold a Buda K-428 gas engine for application in well irrigation.

CONTINENTAL OIL CO., Ponca City, Okla., has purchased a LeRoi 1500 diesel power unit for its Wyoming project for a compressor station.

ALASKA OIL & GAS Development Co., Anchorage, is making use of a Walker-Neer spudder powered by a Cummins NHRPS-600 diesel engine in rugged terrain and all types of weather.

POWER TRANSMISSION and Equipment Co., Seminole, Okla., has sold a Bucyrus-Erie spudder with a Buda MO-672 gas engine.

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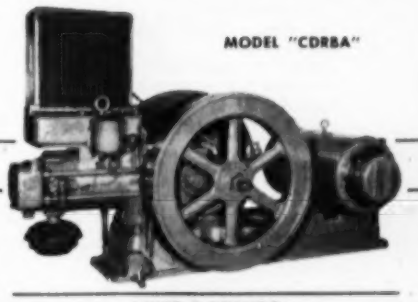

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Model	Cooling	Continuous Rating KW	Continuous Rating Engine rpm	Drive
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"ADTDA"	Tank	2.4	1200	Direct
"BDRBA"	Condenser	4.9	900	Direct
"BDTBA"	Tank	5	900	V-Belt
"LDRBA"	Radiator	5.4	1350	V-Belt
"LDTBA"	Tank	5.7	1350	V-Belt
"CDRBA"	Condenser	7.7	750	V-Belt
"CDTBA"	Tank	8	750	V-Belt

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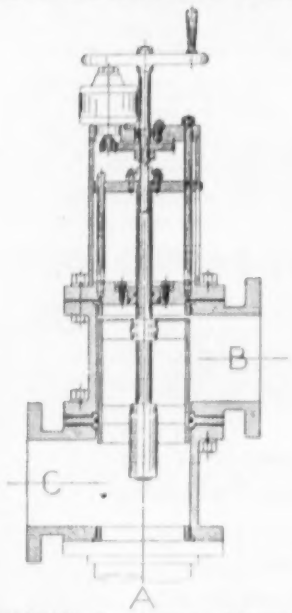

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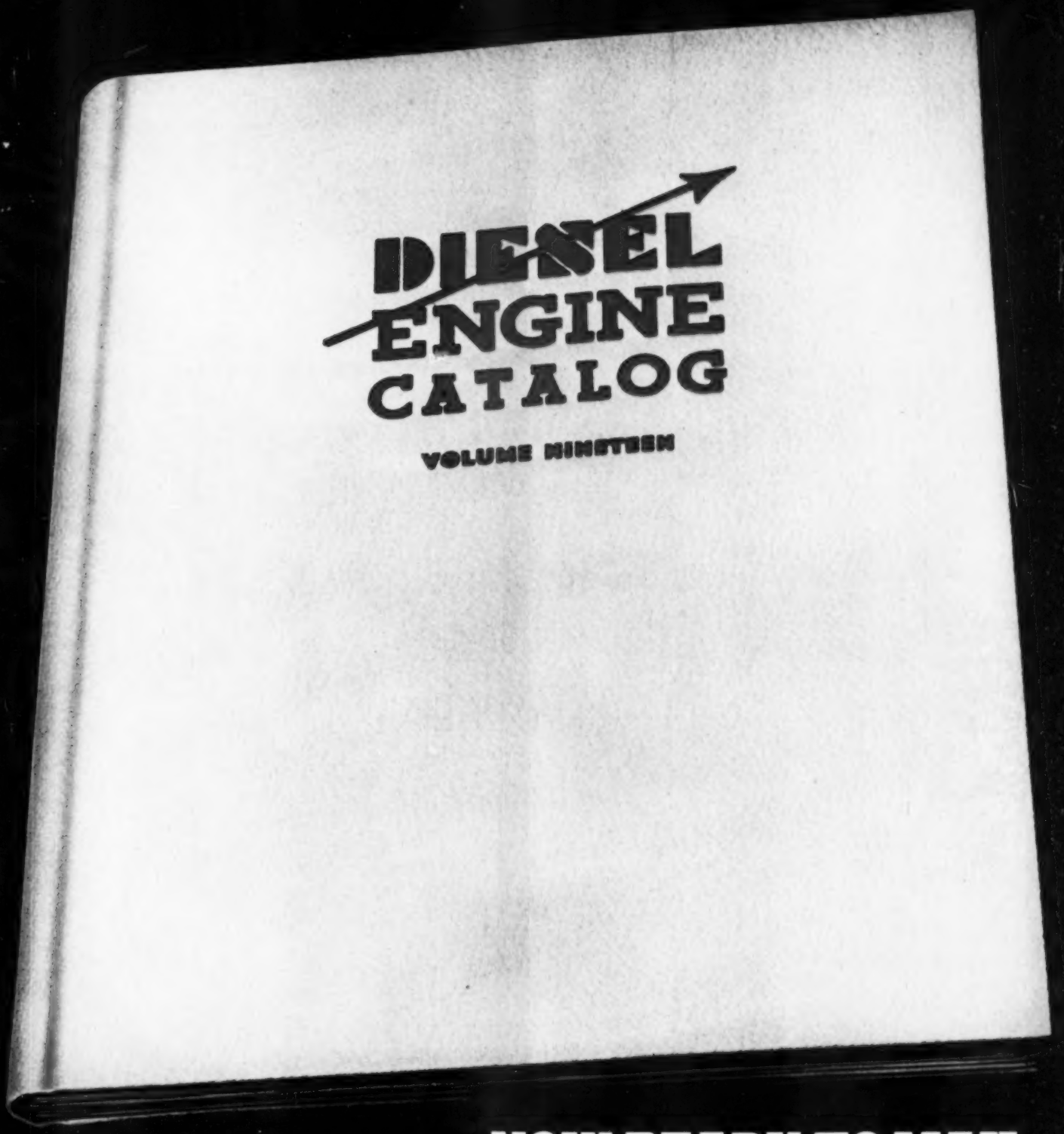

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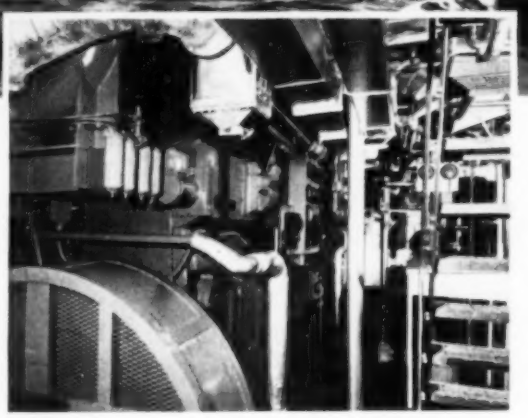

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